

LiquiFire™ User's Guide



LiquidPixels™, Incorporated

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LiquidPixels' LiquiFire allows users to dynamically create and manipulate images on-demand, in real time. Images are created or altered by sending commands to the LiquiFire server, which will perform the operations and return the processed image.

LiquiFire presents many capabilities to the web designer, such as support for all popular image file formats, ability to render and manipulate vector images such as Encapsulated PostScript (EPS) and Scalable Vector Graphics (SVG), full International Color Consortium (ICC) color management, international (Unicode) typographic support, and manipulation of Exchangeable Image File (EXIF) and International Press Telecommunications Council (IPTC) *metadata*. Metadata – information about information – is data carried along with an image to convey additional details or characteristics beyond the picture itself.

LiquiFire assets such as images, image chains, color profiles, and fonts, can be acquired from many sources – over HTTP, FTP, or from an image repository on a LiquiFire server. They can be processed by *requests* sent to a LiquiFire server. Requests are a series of LiquiFire commands, described in detail in “Base Command Set” on page 73.

While LiquiFire is a very complex and powerful environment empowering the web designer with unmatched capabilities, it doesn't need to be intimidating – simple color, size, or format adjustments are extremely straightforward, and the most complex processing operations can just as easily be expressed. No detailed knowledge of imagery, file-formats, or image processing is necessary to take advantage of LiquiFire's potential.

The LiquiFire environment is managed via LiquiFire Orb™ – a sophisticated web-based environment through which all aspects of LiquiFire operation may be controlled. All configuration, maintenance, and monitoring that is required to operate a single server or LiquiFire cluster environment can be performed from within LiquiFire Orb.

Images

Digital images are the obvious basis for all LiquiFire processes. Images exist in many forms on the Internet, but in LiquiFire they can all be thought of in a single, unified fashion.

An image is comprised of one or more *frames* – a series of sub-images contained within one main image – which when rendered represent an array of pixels that can be displayed or printed.

In addition to being comprised of frames, images may:

- be described as pixels or as instructions
- contain image-specific metadata
- contain esoteric metadata
- have transparent regions, known as alpha channels

Metadata is information carried along with an image that may be used for informational purposes. The width of an image, its format, original source, etc., are all examples of metadata. Images in LiquiFire always maintain their metadata throughout the image chain. Metadata is discussed more fully later, in “Image Specific Metadata” on page 13.

The Image Pool

When working with images in LiquiFire, images may need to be acquired or created. As images are introduced by a command in a request, these images reside in an *image pool* – a temporary collection of images maintained during each request. A separate image pool is created for each request, and is drained when the request is complete. Images in the pool are named so they can be identified and manipulated.

A special image in the pool – the current image, has a special name: ‘..’. All imaging operations affect the current image.

Certain commands add images to the image pool, and will accept an optional name argument by which the image in the pool will be known. If two images are named identically, the latter replaces the former in the pool.

Images in the LiquiFire environment may have multiple frames. If the file from which an image is retrieved supports multiple frames, it will be added to the pool just as any other image via the `source` command. As well, frames may be also added to images already in the pool. Once a multiple-frame image is in the pool, individual frames may be selected with the `select` command and subsequently manipulated as an independent image.

Image Chains

The *image chain*, the heart of a LiquiFire command, is a representation of a sequence of steps necessary to create the desired result image.

Image Chains are built within LiquiFire by sending a series of commands, called a request. As the request is processed, each command is interpreted, in sequence, resulting in the creation of an image chain. The image chain, along with its associated metadata is contained within a *job*.

There are three types of commands which may be sent to LiquiFire: *direct*, *macro*, and *metacommands*. Direct commands are the most common, resulting in the addition of an Operator to the image chain. Macro commands, may perform additional computation or processing, such as database queries, calculations, etc., before optionally adding zero or more Operators to the image chain. Finally, metacommands allow manipulation of non-image data (metadata) associated with the request.

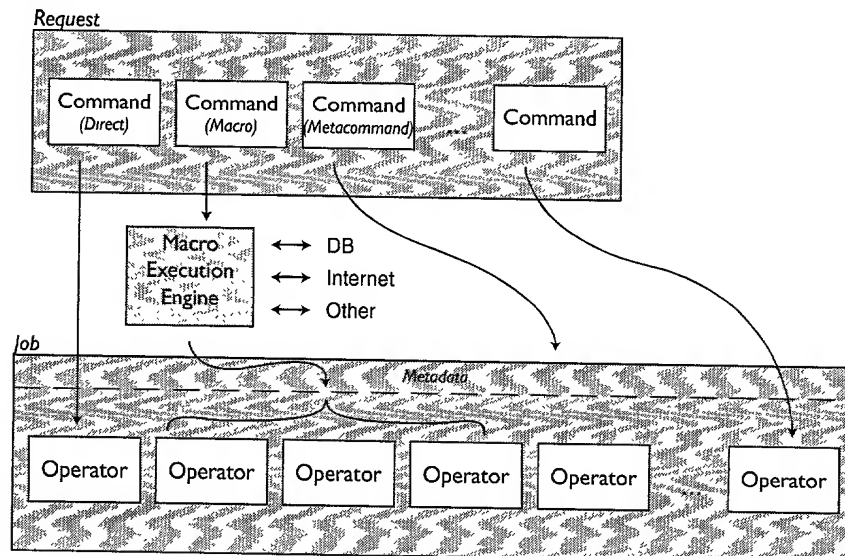


FIGURE 1. Command Processing

Let's look at a simple example:

Suppose you want to display an image in a web page within a space 200 pixels wide and 200 pixels tall. There are three steps required to process this image: Acquire the source image, scale it to the desired size, and send it to the requesting browser in a format the browser understands.

Graphically, the request might look like:

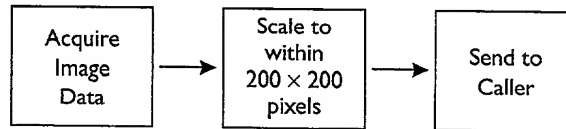


FIGURE 2. Simple Request Representation

The above illustration shows three direct commands within a simple request. These three direct commands will each create a single operator in the image chain.

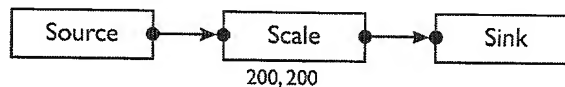


FIGURE 3. An image chain

The resulting image chain is no more complex.

Chain Representation

Image chains themselves are not directly created. Rather, they are represented as a sequence of commands, each with a list of optional arguments. Each command represents one or more operators, macros or metacommads. These commands, in turn, are interpreted to create the image chain.

Image chains can be represented in many different ways. In fact, while LiquiFire understands image chains represented as either HTTP or XML, additional representations can be added to LiquiFire if needed.

The example depicted in Figure 3 contains three operators, with the second having two arguments, width and height. This example can be represented with three corresponding commands in an HTTP request.

The HTTP syntax for LiquiFire is designed to be simple to read and develop. For the technically inclined, the Modified Backus-Naur form (mBNF) of the HTTP request is listed in the Appendix, "HTTP Syntax Definition" on page 187.

Commands are identified by name, and may result in one or more (as in the case of a macro) operators being added to the image chain. Optional named arguments

begin with an equals sign '=' and are separated by commas ',' with their values surrounded by square brackets '[' and ']'). Commands may have zero or more arguments.

```
commandName=argumentName[value],anotherArg[AnotherValue]...
```

FIGURE 4. Example Command Syntax

This User's Guide will focus solely on the http representation of LiquiFire requests. In the http request form, commands are processed in sequentially, and are separated in the request by an ampersand character '&' as per the http standard for get requests:

```
commandOne=argOne[valueOne],argTwo[valueTwo]&commandTwo&...
```

FIGURE 5. Multiple Commands

For legibility in this document, Requests within the examples may be separated into several lines.

Returning to our simple image-scaling example above, represented as a real LiquiFire Request, it might be:

```
source=url[http://www.liquidpixels.net/images/cat.jpg]&
scale=geometry[200x200]&
sink
```

FIGURE 6. Simple LiquiFire Command

Here we can easily see the three commands, `source`, `scale`, and `sink`, together in a single request.

Multiple Images

Many requests will need to perform processing on more than one image. Yet the image chain representation becomes no more complex. In this example, one image is composed with another – the secondary image is blended, or layered, with the first at the location specified in the chain.

Graphically, the chain we would like to create looks like:

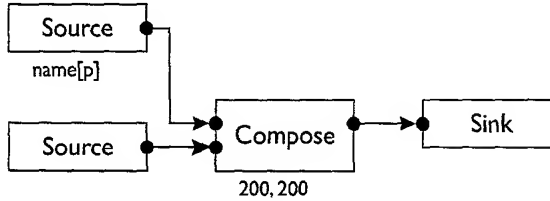


FIGURE 7. Multiple Image Chain

Since requests are represented as a sequence of commands, we must use references to other commands to describe a bifurcated chain. The image chain above could be created by the following LiquiFire request:

```

source=url[http://www.liquidpixels.net/images/penguin.gif],
name[p]&
source=url[http://www.liquidpixels.net/images/truff.jpg]&
composite=compose[Over],image[p],x[200],y[100]&
sink
  
```

FIGURE 8. Multiple Image Commands

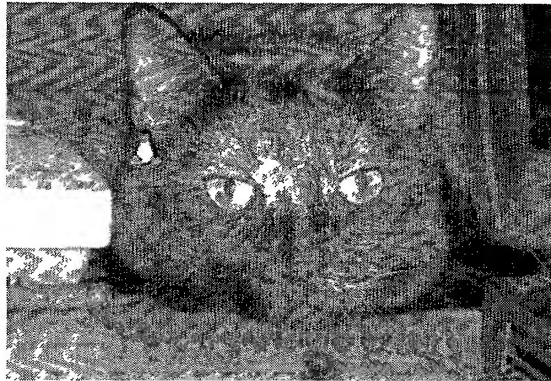


FIGURE 9. Simple Composition

Notice in this example there are two `source` commands, with the first one additionally specifying a `name` argument with the value of `'p'`. This additional argument tells LiquiFire to take the `penguin.gif` image and add it to the pool as an image

named 'p'. The second source command does not specify a name – the image is added to the pool as the current image, or '_'.

The `compose` transform operator requires a composition type specified by the `compose` argument and the name of an image in the pool to compose with the current image, specified by the `image` argument. The optional `x` and `y` arguments define an offset for the composition. Complete details of all the commands and their arguments is in the chapter, "Base Command Set" on page 73.

Now let's look at a small change to the previous example:

```
source=url[http://www.liquidpixels.net/images/truff.jpg],
  name[cat]&
source=url[http://www.liquidpixels.net/images/penguin.gif],
  name[p]&
select=name[cat]&
composite=compose[Over],image[p],x[200],y[200]&
sink
```

FIGURE 10. Alternative Composition Commands

There are two differences here. First, the order of the `source` commands has been reversed, and both `source` commands specify image names. Second, there is a new command: `select`, used to make one of the images in the pool the current image. Functionally, this example is no different from the previous, but it can be easier to understand, since the 'current image' is no longer an inferred assignment.

Asset Sources

As noted earlier, LiquiFire assets can be acquired from many sources. The source of an asset is specified as a URI, with the `http://`, `https://`, `ftp://`, `gopher:`, and `file:` method types supported. Additional types may be added to LiquiFire.

For the common network based methods, the asset is retrieved from the location specified by the URI to the LiquiFire server where they are stored and managed by LiquiFire's intelligent caching system. If the original image is altered, it will be re-transferred to LiquiFire, otherwise, once the image is managed by LiquiFire, it is not re-transferred unnecessarily.

URIs utilizing the `file:` method direct LiquiFire to retrieve the specified asset from the local LiquiFire Asset Pool. Assets may be added to and managed within the Asset Pool via LiquiFire Orb, discussed in "Resident Assets" on page 46.

Vector formats allow for limitless scaling and rotation of imagery without the pixel re-sampling and resulting reduction of quality otherwise necessary.

Images can be acquired in an ever-growing list of file formats, including formats that do not represent images as pixels, such as PostScript™, Encapsulated PostScript (EPS) or Simple Vector Graphics (SVG).

Image Creation

Certain situations will warrant the introduction of a new (possibly blank or patterned) image into the image chain. Perhaps a transparent spacer image is needed, or a background on to which text will be drawn. The `blank` command adds a blank image creation operator to the image chain.

The `blank` command is used to add an operator to the image chain that creates a new solid image in the image pool:

```
blank=color[red],width[100],height[30]&
sink
```

FIGURE 11. Creating a new image

The new image can be created in any color desired, with many standard colors available by name. The complete list of named colors and the format for specifying custom colors is in the Appendix, "Color Definitions" on page 173.

Stored Chains

Note the difference between a macro command and a stored chain. Macro commands are executable computer code designed to perform complex, and often custom, operations during image chain creation. Stored chains, on the other hand, allow users to store often used request fragments for simple re-use later.

LiquiFire image chains can be stored to disk and can be retrieved from disk or any network accessible location. This ability to store image chains – as portions or complete chains – allows users to amass a library of imaging functions which can be assembled later to perform imaging tasks. Coupled with the use of esoteric metadata (see "Metadata" on page 13) and the `set` command (page 168), stored chains can behave as *functions*, allowing simple URLs to achieve powerful results.

Suppose you wish to adorn a set of web pages with section tabs similar to the one below:



FIGURE 12. A Graphic Tab

With the graphic for the image tag created as an EPS file, the following image chain could be used to create a section tab with a section name:

```
source=url[file:tab.eps]&
annotate=font[Arial-Roman],pointsize[9],text[Section+One],
gravity[Center],fill[black]&
sink=format[GIF]
```

FIGURE 13. Section Tab

With this simple image chain, section tab images can be easily created for any area of the web site, without needing to create them ahead of time.

Since stored chains are referenced by URI just as any LiquiFire asset, they may be stored within the Resident Asset Pool or any network-accessible web of FTP server

With stored chains, however, this repetitive process can be made simpler. By replacing the text argument in the annotate command with a reference to global esoteric metadata, a portion of this image chain becomes a reusable function stored on the LiquiFire server. Notice that the sink command was omitted from the request.

```
source=url[file:tab.eps]&
annotate=font[Arial-Roman],pointsize[9],
text[global.section],gravity[Center],fill[black]
```

FIGURE 14. Section Tab Fragment

Image chain fragments can be stored on any server in a file, and can be retrieved as part of a request by using the `load` command (see “load” on page 165). The `set` command (see “set” on page 168) can be used to assign values to global metadata fields within stored fragments. If the image chain fragment above in Figure 14 was stored on a web server `http://www.domain.com` in the file `/chains/tab.chain`, then the following image commands could be used to create a tab graphic:

```
set=key[section],value[Section+One]&
load=url[http://www.domain.com/chains/tab.chain]&
sink
```

FIGURE 15. Using a Stored Chain

Resulting in a customized tab image:

**FIGURE 16.** Custom Tab Image

Resident Assets

LiquiFire assets – images, fonts, stored chains – can be retrieved from any valid URL. LiquiFire supports the `file:` method within these URLs, indicating that the asset should be retrieved from the LiquiFire resident asset pool. This section describes LiquiFire Orb's facilities to manipulate and explore the asset pool.

LiquiFire's asset pool is divided into three distinct sections, each matching a corresponding type of data and therefore, matching a class of commands. The `source` command looks to the art asset pool; `annotate`, `text`, `mftext`, and `textcurve` look to the fonts asset pool; and the `load` command looks to the chains asset pool. Additionally, the `addprofile` command looks to the art asset pool for ICC color profiles.

When several LiquiFire servers are installed as a cluster, each slave server accesses a synchronized copy of the master's Resident asset pools, providing unified access to assets without any reduction in performance. Synchronization occurs on a regular basis, determined during configuration via LiquiFire Orb, and can be performed manually at any time.

Additional information regarding the Resident asset pools, manipulation capabilities of LiquiFire Orb, and cluster synchronization can be found in "Resident Assets" on page 46.

Expressions

LiquiFire commands may contain arbitrary mathematical expressions which will be evaluated when the image chain is created from the request. Expressions are enclosed by parenthesis '(' and ')', and may contain references to image metadata fields.

Expressions are an important element of LiquiFire's flexibility. They permit image manipulations to be constructed in situations where certain aspects of the source image or the necessary target are not known, or when metacommands are used to make decisions during rendering.

Simple expressions are useful to increase clarity within some operation. For example, let's look again at the penguin composition example on page 6. In this case, however, let's position the penguin at the center of the underlying cat image. To do this, we need to know the size of the cat image – information which we don't have available, but can use expressions (and image metadata) to determine.

```
source=url[http://www.liquidpixels.net/images/penguin.gif],
name[p]&
source=url[http://www.liquidpixels.net/images/truff.jpg]&
composite=compose[Over],image[p],
x[( .width/2)],y[( .height/2)]&
sink
```

FIGURE 17. A Simple Expression

Notice that the image specified in the second `source` command above, while not explicitly named, can still be identified by the current image name '_'.

The identified image metadata width and height (see section "Metadata" on page 13) are each used within small expressions to determine the center of the current image (named '_').

Expressions in LiquiFire are not typed – an expression resulting in a numeric result can be used later as text to be drawn onto an image. Likewise, textual, yet numeric metadata can be used within arithmetic expressions.

Certain characters may not be permitted within a request of a specific form. HTTP requests, for example, present a limited character set due to the use of several characters by the protocol to indicate special meaning. In all cases, however, encoding techniques specific to the representation can be used to overcome this limitation.

LiquiFire Explorer, a component of the Orb management environment, can assist with URL encoding.

Several Metacommands are available that perform decision making operations such as if-then, string matching, or time and date determination. These Metacommands all perform by manipulating global metadata, and the results of their operation can be used within expressions. Let's look at a more complex example:

```
blank=width[600],height[60],name[bg]&
annotate=text[Only],font[Arial-Bold],pointsize[22],
    fill[black],y[35],x[10]&
annotate=text[days+left+till+Christmas],font[Arial-
Bold],pointsize[22],
    fill[black],y[35],x[150]&
countdown=target[12/25/2001],key[days]&
annotate=text[global.days],font[Dominican],pointsize[36],
    fill[red],y[40],x[82]&
optimize&
sink=format[gif]
```

FIGURE 18. Countdown Example

In the previous example, the number of days remaining until Christmas 2001 is determined by the countdown metacommand supplied with LiquiFire. The resulting number is placed in the global metadata in a field named days, specified by the key argument in the countdown command. Each time this request is processed, the operators that result may contain different values, based on the number of days remaining. This information is used by the annotate command later in the request to draw a custom message on the image. Simple, yet very powerful.

Conditional Execution

Sometimes there are situations where a command within a request should only be executed if a certain criteria is met. Perhaps an image should only be reduced if it exceeds a certain size. Or, perhaps, only images in CMYK should only be converted to RGB, as illustrated in Figure 19. LiquiFire's conditional execution of commands allows for command processing to occur only if a criteria is valid.

```
source=url[http://www.liquidpixels.net/images/Spain.jpg],
    name[image]&
scale=size[500]&
addprofile=url[file:profiles/sRGB.icm],
    if[('image.cclcrspace' ne 'RGB')]&
sink
```

FIGURE 19. Conditional Execution Example

Any LiquiFire command may contain an additional special argument, '*if*'. when the if argument is present for a command, the value of the if argument is evaluated, and the command will be skipped during processing if the value is numerically zero or blank.

Metadata

Images have two components: a visible component, represented as pixels, vector information, or instructions, and a non-visible component called metadata. Metadata comes in two forms, image-specific metadata, representing physical aspects of an image (height, width, color depth, format, etc.) and logical aspects of an image (cached, name, etc.) and esoteric metadata, representing any additional information associated with an image by the user. Image-specific metadata is inherent to the image, it can not be changed explicitly, while esoteric metadata can be arbitrarily manipulated as needed. Esoteric metadata can be manipulated by the attribute command.

Both types of metadata are available to LiquiFire commands within a request. There is no distinction made between image and esoteric metadata within a request.

Metadata is accessed by image pool name, followed by a dot '.' And the name of the metadata field desired. For example, the string `cat.width` could be used within a command to determine the width of an image named `cat`. The current image can also be queried for metadata, even when it is not explicitly named by using an underscore '_' as the image name (`_.width`).

Beyond metadata associated with an image, there is also metadata associated with a request. This metadata, solely esoteric, can be used to pass information between commands in a request, much as variables are used in programming languages. Request-centric metadata is known as Global metadata, and is accessed via a special image name `global`.

Esoteric metadata can be set globally or specifically for an image by using the `set` metacommand, or by certain other metacommands and macros that may make decisions or calculations earlier in a request.

Image Specific Metadata

Two forms of image-specific metadata are detected and extracted by LiquiFire for use in image chains: IPTC metadata and EXIF metadata.

The International Press Telecommunications Council, or IPTC, defines a format for the exchange of metadata in news content including photographs. Many desktop imaging applications allow you to add IPTC metadata to your images, or view any data already in place. The IPTC metadata fields are listed in "IPTC Metadata" on page 193.

The EXIF, or Exchangeable Image File, defines a common format for image interchange in use by most digital cameras on the market today. Along with the image capture, devices supporting EXIF will populate the EXIF metadata fields with camera-

and possibly location-specific information known at the time of capture. The EXIF metadata fields are listed in “EXIF Metadata” on page 196.

Both EXIF and IPTC metadata can appear in an image together.

14

Non-Imaging commands

Non-Imaging commands are commands which, when executed, result in the addition of zero or more new operators added to the image chain. They differ from basic commands in that they do not perform imaging operations themselves. Rather, they are useful to make decisions, fetch data from an external source, perform repetitive commands, and to reduce complex, yet often-repeated imaging operations into a simple single command.

Non-imaging commands can be separated into two categories: metacommands and macros.

Metacommands

Metacommands are commands intended to manipulate metadata. LiquiFire has several stock metacommands:

Command	Function	Reference
countdown	Calculates the time remaining from the current time until the date specified.	page 161
fontmetrics	Determines the future resulting size of text when rendered in a specified font and size.	page 164
regexcase	A case statement for string expression matching.	page 166
set	Sets a field in the global metadata to the value specified	page 168
timecase	Given a list of dates, times, or date-times, returns the corresponding value when the current time falls within one of the specified ranges.	page 170

Macros

LiquiFire is designed to be extensible. One of the areas in which LiquiFire can be extended is via the development of custom Macros. A macro appears as any other command within a request, but may be designed to perform complex computations, database access, or other computations as precursor steps to adding zero or more operations to the image chain, or setting esoteric metadata. A macro may, for example, be developed to query a database of product information and set esoteric metadata to the current price. This metadata could then be used later in the request to image sale information on the image, or as the basis for conditional execution of a command.

Certain macros are simple conveniences – the common use of LiquiFire to create an image containing styled text rendered in an attractive typeface can be simplified via a macro. To do this takes without a macro three steps: first, determine the size of the

Security

In most environments, there is no need to restrict access to a LiquiFire server or cluster. Some environments, however, will require certain restrictions to be placed on access to the server.

LiquiFire security is disabled by default. See “LiquiFire: Host” on page 28 for information on using LiquiFire Orb to enable security and how to select the types of restrictions. See “LiquiFire: Client Access” on page 31 for further information regarding the creation of host access lists.

There are two mechanisms by which access to a LiquiFire server can be restricted: referring host, and keyed requests.

Referring Host

This method is most applicable to websites using LiquiFire for imaging within their own environments or a limited number of external environments. It is not a desirable mechanism for securing LiquiFire access within the arena of HTML e-mail.

When a web browser makes a request to a server, it sends with the request information describing the HTML resource that referred the request. When following a link from one HTML page to another, for example, the browser informs the web server of the URL from which the second page is accessed. When a browser makes a request for an image, the web browser will inform the server the URL of the page containing the image tag.

It is this information that LiquiFire uses to restrict use of a LiquiFire server by alien sites. To do this, LiquiFire must be presented with a list of server names (or URLs) for which requests are permitted. Once the list is complete, and `host` based security is enabled, any attempts to access LiquiFire via an image tag served by a server not listed will not be permitted. Operation is transparent when the request is made from a web browser, even under JavaScript control.

Keyed Requests

When requests are made from a non-browser environment – HTML e-mail, a Java applet, an application – the referrer information used in host based security is not present. In this case, an additional command must be added to the LiquiFire chain containing a `key`, unlocking LiquiFire for that request.

A unique key is created for each request to be made; keys are based on the image chain itself, and a ‘secret’ known to the LiquiFire owner. Keys may be created by using LiquiFire Configurator, or by implementing the algorithm available from LiquidPixels.

Let's look at a quick example of a keyed request. Suppose you wish to use LiquiFire to perform the following imaging manipulation:

```
source=url[http://www.liquidpixels.net/images/cat.jpg]&
scale=geometry[200x200]&
sink
```

FIGURE 20. Simple Request

Attempting to make this request to a LiquiFire server configured to have key based security enabled will result in an access denied error. To unlock LiquiFire, we first must generate the key for this request via configurator. The resulting key might look like `d409fb30` or `UmFuZG9tSVoWQPNCmpQy1SiDuszzKici0+sWSvhmpYY=`, depending on the strength of the key you requested, a hash or cipher, respectively.

Once the key has been obtained, the request is slightly modified to include this additional information:

```
source=url[http://www.liquidpixels.net/images/cat.jpg]&
scale=geometry[200x200]&
auth=hash`d409fb30`&
sink
```

FIGURE 21. Simple, Authorized Request

The `auth` command may appear anywhere in the image chain. See “`auth`” on page 161.

Cache

LiquiFire maintains two separate cache systems: an *asset cache*, for source images, fonts, profiles, and stored chains; and a *render cache*, for rendered images. Both caches perform the same basic function, to keep recently accessed data near-by such that subsequent accesses are as rapid as possible.

Asset Cache

When any asset is requested via URL in a command such as `source` or `annotate`, the asset is retrieved from the location specified and stored within the LiquiFire Asset Cache. Subsequent requests for the same asset will use this cached copy, saving the overhead of the network retrieval.

In clustered LiquiFire environments, this asset cache is automatically synchronized to appear as a single, unified, transparent cache. LiquiFire Orb can be used to remove individual items, flush the entire Asset Cache, or initiate validation of the cached data with the original remote assets. See page 51 for further information.

Render Cache

Similar to the Asset Cache, LiquiFire maintains a cache of all rendered images. This cache is used to accelerate repeat requests for a chain, serving the cached result rather than re-render the image. The decision to return a cached image is based on the request; requests must match *exactly* to cause a cached response to be used.

LiquiFire's Render Cache subsystem yields very high performance, and may be used as a mechanism to serve pseudo-static images – images which are dynamic, but which change infrequently – in a fashion akin to conventional batch processing.

LiquiFire Orb can be used to remove individual items, or flush the entire Render Cache. See page 49 for further information.

LiquiFire is a complex environment. That said, there are only a few simple configuration aspects that need to be performed to bring a new server on line. In fact, aside from entering basic host information in the “LiquiFire: Host” pane on page 28, there is no additional required configuration necessary.

This chapter covers LiquiFire Orb, a Web-based tool used for LiquiFire configuration, maintenance, monitoring and access to other helpful tools.

Clustering

LiquiFire can be installed as a single server, as multiple discrete servers, or as a *cluster* – a collection of servers working in concert as a single server.

Multiple LiquiFire servers, or *nodes*, can be assembled in many varying configurations, depending on the task or environment. While typical configurations of single servers as well as a cluster containing a single Master and one or more slaves, it is possible to configure complex cluster architectures.

Each LiquiFire server contains several functional components. Nodes can be configured as a Master or Slave. Master nodes can perform image manipulations, but can additionally manage the other nodes in the cluster. Slave nodes perform as highly-efficient workers, operating to only perform rendering.

Orb

LiquiFire Orb™ is a sophisticated web-based environment through which all aspects of LiquiFire operation may be controlled. All configuration, maintenance, and monitoring that is required to operate a single server or LiquiFire cluster environment can be performed from within LiquiFire Orb.

Starting Orb

LiquiFire Orb is accessed through any standard web browser at

`http://ipaddress:88/`

where `ipaddress` is the ip address of your LiquiFire server. You will be presented with the LiquiFire login screen similar to Figure 22.

The name of the LiquiFire server you are accessing will appear below the Orb title, similar to the name 'LiquidPixels Public' is displayed in this example. If you have not yet configured the name of the server, nothing will be displayed.

LiquiFire™ Orb™
LiquidPixels Public



LiquiFire™ Orb™ Version 1.12
Copyright © 2000, 2001 LiquidPixels™, Incorporated
All Rights Reserved

FIGURE 22. Orb Login

As shipped, Orb has a single account, with username `liquifire`, and password `admin`. Using Orb, both the username and password can be changed later. It is strongly recommended that the default username and password be changed at the earliest opportunity, to prevent unauthorized access to LiquiFire Orb. LiquiFire Orb will automatically require you to re-login after a certain amount of inactivity.

Once successfully logged in, you will be presented with the following screen:

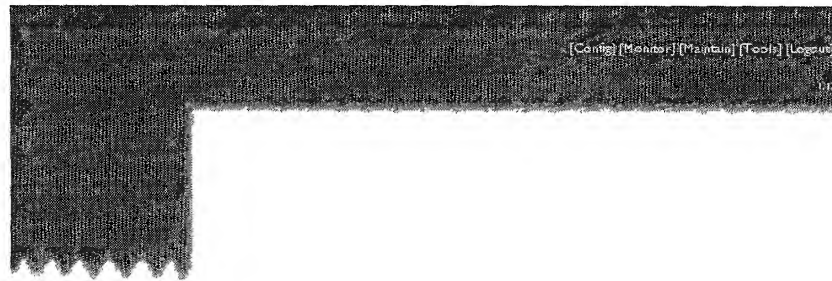


FIGURE 23. Orb Main Screen

The top right area of the Orb screen presents up to four sections, representing the four actions of Orb may be used to perform.

Section	Functions Within
Config	Functions relating to the core configuration of a LiquiFire server, cluster member, or whole cluster.
Monitor	Monitoring LiquiFire performance, activity, and behavior
Maintain	Allows manipulation of LiquiFire asset storage for artwork, fonts, and chains, as well as to query or clear the asset and render caches
Tools	Tools for chain development, foreign-character set exploration, and chain cipher generation
Logout	Leaves LiquiFire Orb

The options available may be restricted, based on the access permissions for the particular Orb user. See "Administration: Users" on page 26 for further information about Orb accounts and access permissions.

Configure

The configuration section is used to control overall LiquiFire operation. This includes Orb account administration, LiquiFire server configuration, Cluster member management, and Remote Access.

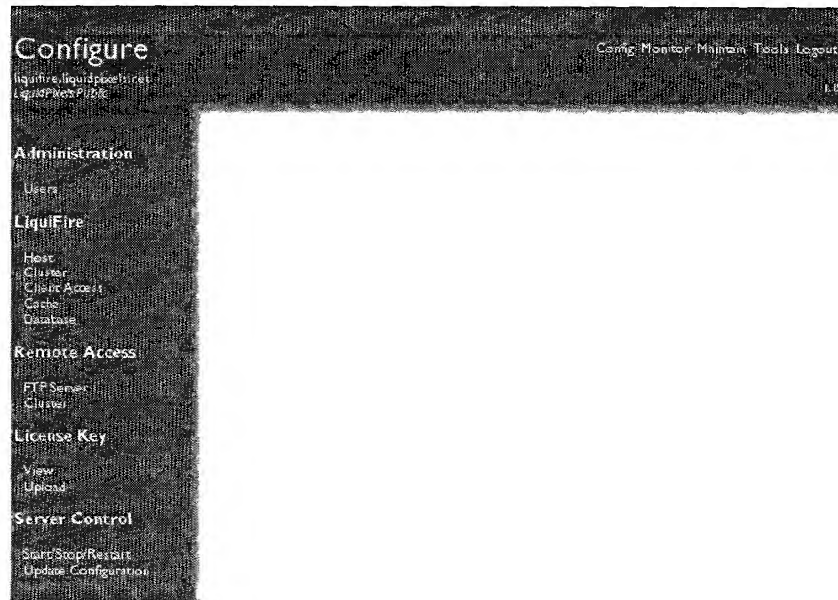


FIGURE 24. Configure Section

The Configure section controls five areas:

- **Administration:** Orb accounts and access permissions
- **LiquiFire:** detailed server, cluster, and database configuration
- **Remote Access:** control aspects of LiquiFire remote accessibility
- **License Key:** view or update the current LiquiFire license key
- **Server Control:** Start, Restart, and Stop LiquiFire

If the LiquiFire server being configured is a *slave*, the Cluster option will not be displayed.

Administration: Users

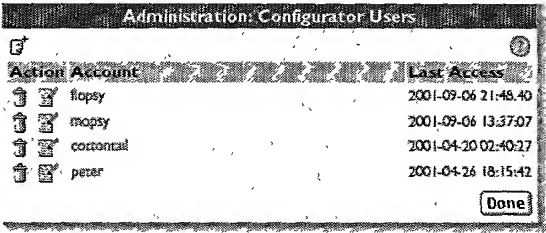






FIGURE 25. Administration: Users

As described above, LiquiFire Orb can be used for four purposes: Configuration, Monitoring, Maintenance, and Tools. The Users pane is used to Add, Edit, and Remove Orb users, each of which may be permitted to use all or some of the four sections.

The pane illustrated in Figure 25 lists the current set of Orb users. Adjacent to each listed account are action buttons, as well as the New Account and Help buttons at the top of the pane. This layout is used throughout Orb.

Command	Description
	New Account Add a new Orb account
	Edit Account Edits a Orb account
	Remove Account Removes a Orb account
	Help

Clicking the New Account or Edit Account icon will display the edit pane, as illustrated in Figure 26. Here the username and password for a user may be entered or changed, as well as select which of the Orb sections will be accessible by the user.

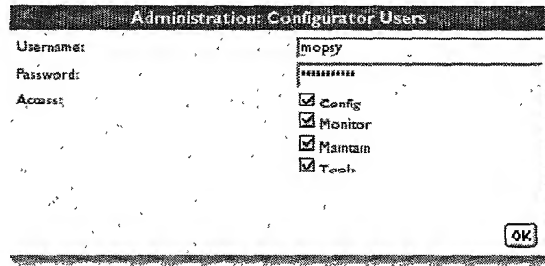


FIGURE 26. Administration: Users: Edit

The default user account, liquifire, has access to all four sections enabled. Be sure to maintain at least one account with configuration access, or you will be unable to make further changes.

LiquiFire: Host

FIGURE 27. LiquiFire: Host

The Host pane is used to configure basic system and network settings for a LiquiFire node. It is divided into three sections: Network, allowing for basic host configuration, Cluster, describing aspects of the entire LiquiFire cluster, and Security, selecting which of the security modes should be active.

Field	Description
Server Name	This field determines the human-readable name for the server. This name will be used to identify the server to the administrator within Orb, in diagnostic messages, and automated e-mail
Hostname	The network hostname of the node
Domain	The network domain of the node. For example, liquidpixels.net
IP Address	The IP address of the node
Port	The TCP/IP port on which the Rendering Engine should listen. Typically 81, this should only be changed when complex server environments require.

Field	Description
Mailhost	The IP address for the SMTP mailhost LiquiFire should use to send email, when required.
Node Type	The node type, either Master or Slave. Nodes may be either Masters or Slaves. See page 22 for a detailed discussion of LiquiFire clustering. Single LiquiFire servers should choose Master; there must be at least one Master node in a cluster.
FQDN	The Fully-Qualified Domain Name for this node. This is the name by which users will access the LiquiFire cluster, as a single logical entity. For a single node, this is typically the combination of the Node Hostname and Node Domain, above. For clusters or other complex situations, such as where IP-Redirectors are used, this field may be different.
Port	The TCP/IP port on which the entire LiquiFire cluster should listen, typically 80
Administrator's Email	The email address to which LiquiFire will send email in situations where problems or other notification is required
URI	The URI to which LiquiFire commands will be made. This is a single word, following the domain name in an HTTP request, illustrated in green: <code>http://liquifire.liquidpixels.net/image?</code>
Security Type	Determines the security model to use when validating requests. See "Security" on page 17 for detailed information on LiquiFire security models.
Autostart LiquiFire	If enabled, LiquiFire and all its subsystems will be automatically started when the server is booted or rebooted.

LiquiFire: Cluster

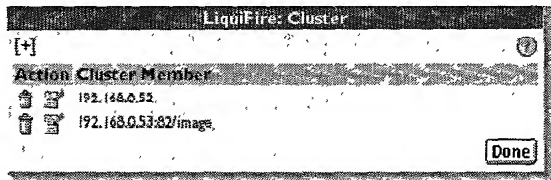





FIGURE 28. LiquiFire: Cluster

LiquiFire servers may be organized into a logical cooperative group called a *Cluster*. In a cluster, several nodes work in concert to share the overall burden of creating, manipulating, and serving images. Clusters are managed by the Master node, and may have one or more slave nodes. On a Master node, this pane allows you to add, edit, or remove members from a cluster as slaves. The members you add may be either Masters or Slaves, according to your desired system design. See “Clustering” on page 22 for additional information on LiquiFire Clustering.

Note that each node added to a Master node must, in turn, have the Master node listed as an authorized Master. See “Remote Access: Cluster” on page 35 for additional information.

While you can add cluster members by either fully-qualified domain name, or by IP address, we recommend that you use IP addresses exclusively.

Members of the cluster may have differing port or URIs than the server to which they will be slaves. In these cases, enter the optional port or URI may be entered along with the IP address in the form ip:port/URI. For example, adding a member as 192.168.0.1:81/image specifies the slave at 192.168.0.1 be accessed via port 81 with the URI image.

Command	Description
	Add Member Add a new member to the cluster.
	Edit Member Change an existing cluster member
	Remove Member Remove a cluster member
	Help

LiquiFire: Client Access

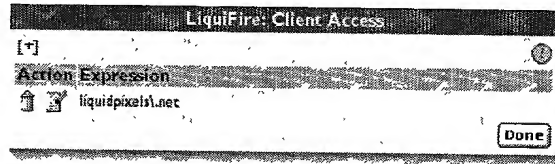





FIGURE 29. LiquiFire: Client Access

As described in “Referring Host” on page 17, one of the mechanisms available for authentication is to control access to a LiquiFire host by Referring Host. This approach requires a list of authorized referring hosts to be maintained.

This pane allows you to manage the list of authorized hosts, by expression¹. Each expression in the list is checked against the referring host, and if a match against any is found, the request is allowed. An expression of `liquidpixels.net`, for example, would match `www.liquidpixels.net` as well as `appletree.liquidpixels.net`.

Command	Description
	Add an Expression Add a new access expression to the list.
	Edit Member Change an existing access expression
	Remove Member Remove an expression
	Help

1. Regular Expressions provide a general mechanism for describing patterns of characters to match. There are many good references on the Web containing detailed information.

LiquiFire: Cache

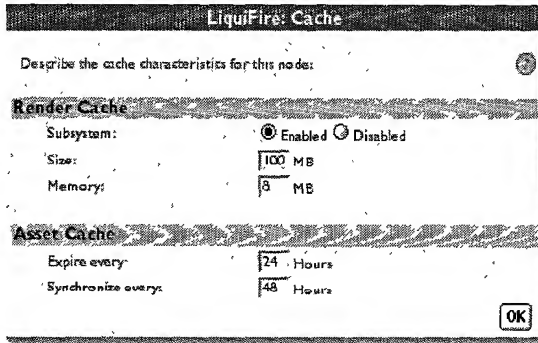


FIGURE 30. LiquiFire: Cache

This pane controls the aspects of the *Render Cache* described in “Cache” on page 19. Each image rendered by LiquiFire is maintained in a complex caching system, allowing repeat requests to be optimised.

Field	Description
Subsystem	Enables or Disables the render cache. The Render Cache must be enabled for Cluster configurations.
Size	Determines how much disk space should be allocated to caching result rendered images, typically 100MB.
Memory	Determines how much memory should be allocated to caching result rendered images, typically 8 MB. In situations where large numbers of requests will likely be made to recently rendered images, it may be desirable to increase this value.
Expire Every	The number of hours after which LiquiFire will contact the original host to verify the asset still exists and has not changed.
Synchronize Every	The number of hours after which LiquiFire will synchronize the Asset cache contents between members in the cluster.

LiquiFire: Database

LiquiFire: Database

Describe the database connections for this node:

Transaction Database

Name: liquifiredb
 Host: 192.168.0.12
 User: liquifire
 Password: ****

Cache Database

Name: liquifiredb
 Host: 192.168.0.12
 User: liquifire
 Password: ****

OK

FIGURE 31. LiquiFire: Database

LiquiFire uses an internal database to manage many of its functions. In certain, specialized situations, it may be desirable to override the default database with which LiquiFire communicates for cache and transaction information. This pane allows you to specify settings for those communications.

Do not alter this information unless you know what you're doing.

Field	Description
Name	The database name in which transaction information is stored
Host	The hostname or IP-address of the server hosting the database
User	The database username
Password	The database password
Name	The database name in which cache information is stored
Host	The hostname or IP-address of the server hosting the database
User	The database username
Password	The database password

Remote Access: FTP Server

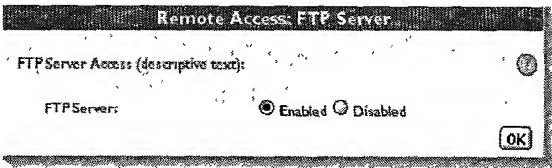


FIGURE 32. Remote Access: FTP Server

LiquiFire’s local asset pool, conventionally managed by Orb as described in “Main-tain” on page 45, may alternatively be access via FTP using any common FTP client.

Field	Description
FTP Server	If enabled, The LiquiFire asset pool may be accessed via FTP

Remote Access: Cluster

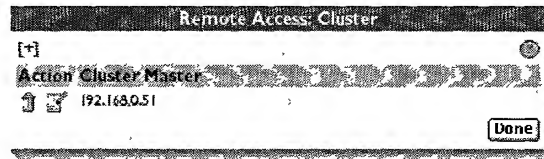





FIGURE 33. Remote Access: Cluster

This pane controls which nodes are authorized to communicate with this node. If a Master node lists this node as a member of a cluster, the slave node, in turn, must authorize connections by the master by listing its hostname or IP-address here.

Command	Description
	Add a member
	Authorize a node to connect to the node as a Master
	Edit Member
	Change an existing member
	Remove Member
	Remove a member
	Help

License Key:View

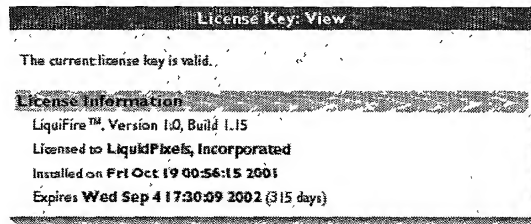


FIGURE 34. License Key:View

This pane displays characteristics of the current, active license key.

License Key: Upload

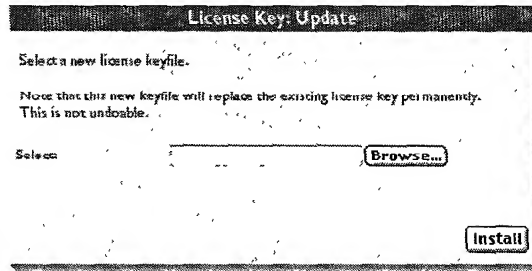
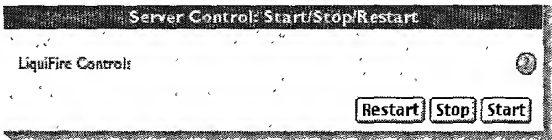


FIGURE 35. License Key: Upload

This pane allows for the installation of a new LiquiFire license key.

When a new key is available, typically sent by LiquidPixels to the customer via e-mail, it can be simply installed via this pane.

Server Control: Start/Stop



Server Control: Start/Stop

When changes are made to LiquiFire’s configuration, the running server must be restarted for those changes to take affect. This pane can additionally be used to stop the server completely, or start a stopped server.

Command	Description
Restart	Restarts the LiquiFire Server, incorporating any changes which have been updated in the configuration
Stop	Stops the LiquiFire Server
Start	Starts the LiquiFire Server

Server Control: Update Config

Once changes to LiquiFire have been completed, the server's active configuration must be updated to reflect the changes. This pane performs that function, and will additionally eMail the current configuration to the server administrator.

Species	Sex	Age	Weight (g)	Length (mm)	Wing (mm)	Tail (mm)	Bill (mm)	Foot (mm)	Claw (mm)	Stomach contents	Notes
Red-tailed Tropicbird	♂	Ad.	110	145	75	65	15	10	5	Empty	1st capture
Red-tailed Tropicbird	♀	Ad.	105	140	70	60	14	9	4	Empty	2nd capture
Red-tailed Tropicbird	♂	Ad.	115	150	80	70	16	11	6	Empty	3rd capture
Red-tailed Tropicbird	♀	Ad.	100	135	65	55	13	8	4	Empty	4th capture
Red-tailed Tropicbird	♂	Ad.	120	155	85	75	17	12	7	Empty	5th capture
Red-tailed Tropicbird	♀	Ad.	108	142	72	62	14.5	9.5	4.5	Empty	6th capture
Red-tailed Tropicbird	♂	Ad.	112	148	78	68	15.5	10.5	5.5	Empty	7th capture
Red-tailed Tropicbird	♀	Ad.	102	138	68	58	13.5	8.5	4.5	Empty	8th capture
Red-tailed Tropicbird	♂	Ad.	118	152	82	72	16.5	11.5	6.5	Empty	9th capture
Red-tailed Tropicbird	♀	Ad.	106	140	70	60	14.5	9.5	4.5	Empty	10th capture

Monitoring

The monitoring section is used to observe and analyze overall LiquiFire performance. This includes overall system status, performance statistics, and request access log.

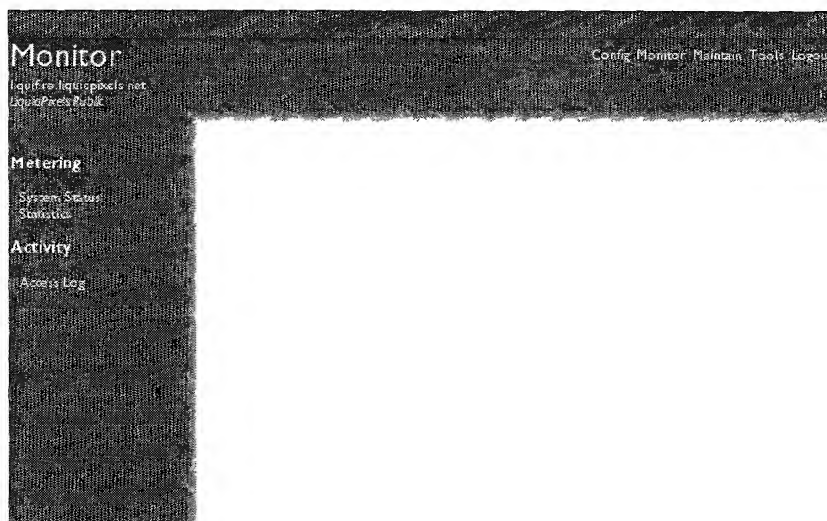


FIGURE 36. Monitor Section

LiquiFire Orb provides several tools which can be used to assess current or past performance of a LiquiFire server or cluster. These tools can be used to simply observe current activity, to analyze the detailed information LiquiFire maintains for each Job run, or to compute usage and performance statistics for a period of time.

Monitoring provides two areas:

- **Metering:** Monitor current performance and server characteristics
- **Activity:** Analyze detailed Job information

Metering: System Status

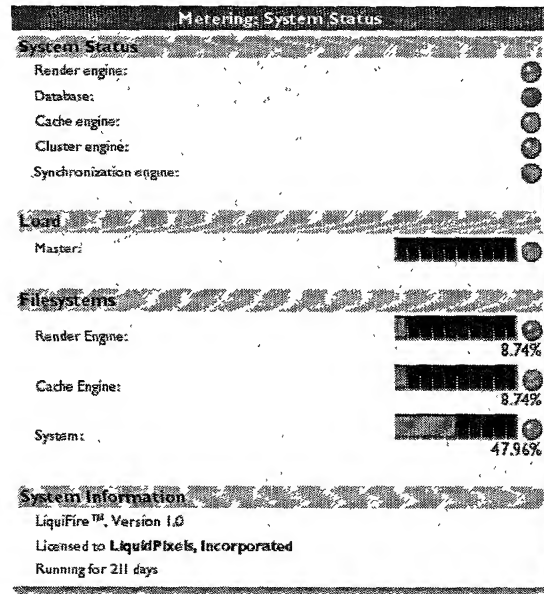


FIGURE 37. Metering: System Status

This pane, within its four sections, displays an overview of the LiquiFire system. Should any of the indicators change to yellow or red, contact LiquidPixels support.

Each of the five LiquiFire subsystems and their respective status, red or green, are displayed under the first section, System Status. Should a serious problem arise, it is possible that one or more of the subsystems will cease to operate, and this information will be useful to pinpoint the problem area, in concert with LiquidPixels support.

Under the Load section, each member in the *Cluster* will be listed, along with an active bar-graph depicting the current server load for that node. These graphs are updated every 30 seconds, while this pane is displayed.

Disk space is monitored in the Filesystems section, with an active bar-graph for each of the active disk areas in use.

Finally the System Information section displays LiquiFire software version, Licensing information (and an expiry warning, as the end of a licence term draws near) as well as a count of server operating time.

Metering: Statistics

Metering: Statistics			
System Status			
	Requests	Pixels	Std Dev
Last Minute:	0		
Last 10 Minutes:	0		
Last Hour:	10	13024	0.083
Last Day:	145	1370781	0.436
Last Week:	1948	34564225	1.709
Performance			
Virtual Host	Average Response	Std Dev	
192.168.0.100	0.034	0.010	
192.168.0.53	0.429	0.018	
beer.penguinpower	0.371	0.001	
liquifire.liquid	0.460	0.003	
localhost	0.324	0.052	
www.liquidpixels	0.577	0.000	
(query took 108 seconds.)			

FIGURE 38. Metering Statistics

LiquiFire collects and maintains various statistics of its performance during operation.

The top portion of this pane provides an overview of recent cluster performance. For each of five timeframes, this area indicates the number of rendering requests (which excludes any requests which are handled by the LiquiFire result cache), the number of pixels served, and the standard-deviation of response time. This last field can provide some overall feeling for performance; if this number becomes 'large' relative to its value for all time, available in the lower portion of the pane, it may indicate larger-than-normal requests, or some other performance limiting behavior is occurring.

The lower portion of this pane provides performance metrics for a liquiFire cluster, broken down by virtual host. Each virtual host indicates the average render response time and standard-deviation for all time.

Activity: Access Log

Activity: Access Log

Enter search criteria.
Results are returned in reverse-chronological order:

JobID: _____

Date: (YYYY-MM-DD) _____

LiquiFire Node: _____

Client: _____

Request/fragment: _____

Max Entries: 100

OK

FIGURE 39. Activity: Access Log

LiquiFire maintains two logs: a simple log of each request, and detailed transaction information for each request. The simple request log is maintained indefinitely, while the details are maintained for 24 hours. This pane provides access to this collection of information.

The pane above allows the user to select which elements of a log they wish to view. Each field is optional; multiple fields are combined as a logical AND. Strings and portions of strings may be entered in any field.

Once the form is submitted, LiquiFire Orb will present a pane containing a list of requests matching the criteria, as illustrated in Figure 40.

Job ID	Date	LiquiFire Node	Client
a300e239	2001-09-28 15:47:37	liquifire.liquid	192.168.0.52
9b613ee9	2001-09-28 14:05:34	liquifire.liquid	192.168.0.52
bc67c98f	2001-09-28 14:05:33	liquifire.liquid	192.168.0.52
5e5b9094	2001-09-28 14:05:30	liquifire.liquid	192.168.0.52
c7ade210	2001-09-28 14:05:30	liquifire.liquid	192.168.0.52
dee594d5	2001-09-28 14:05:30	liquifire.liquid	192.168.0.52
773a93aa	2001-09-28 14:05:28	liquifire.liquid	192.168.0.52
0f182cd	2001-09-28 14:05:27	liquifire.liquid	192.168.0.52
2322ad11	2001-09-28 14:05:27	liquifire.liquid	192.168.0.52
7c7a2361	2001-09-28 14:05:27	liquifire.liquid	192.168.0.52

FIGURE 40. Activity: Access Log Request Listing

Each line represents a request to LiquiFire, and is displayed along with its JobID, the date and time of the request, the node within the cluster that handled the request, and the IP address of the client making the request. Clicking on the JobID of a request will display additional detailed information, as illustrated in Figure 41.

Activity: Access Log	
Request ID: 3e0b591a	
Date: 2001-09-28 17:10:44	
text=font[GillSans-Bold],pointsize[24],fill[Navy],text[Hello Again]& transparent=color[white]& sink=format[gif]& nocache[1001711444]	
Re-Run Job	
Module	Message
Job	Request: text=font[GillSans-Bold], pointsize[24], fill[Navy], text[Hello Again]& transparent=color[white]&sink=format[gif]&nocache[1001711444]
Job	Command nocache not found
Job	Expanding text macro
Connector	Starting job: '29463570'
Job	Job 3e0b591a started: [0.147s]
OPmain.blank	image _ is 136 x 30
OPmain.annotate	Increment (no width set)
OPmain.sink	Sink GIF
OPmain.sink	Sink GIF Handler
OPmain.sink	result image is 136 x 30
OPmain.sink	Sending GIF image as image/gif (763 Bytes).
Job	Job complete: [0.446s]
Connector	Request complete: [0.447s]

FIGURE 41. Activity: Access Log Details

This pane contains the request, JobID, Date and Time, and detailed execution information for each stage of processing.

Maintain

The maintain section provides a convenient and powerful interface to LiquiFire's resident asset and cache areas. Through this section, files within a LiquiFire server or cluster may be fully manipulated, including archiving and editing.

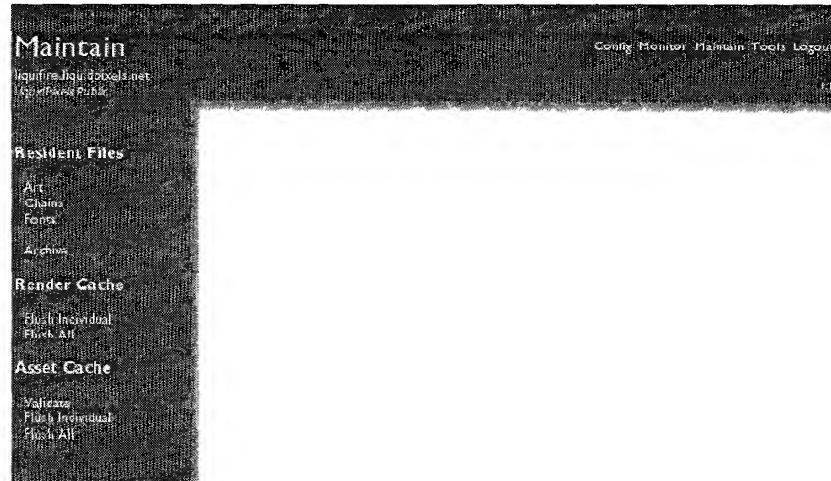


FIGURE 42. Maintain Section

LiquiFire Orb's Maintain section provides all tools necessary to navigate the resident files, to add, delete, rename, and view artwork, chains, and fonts.

Monitoring provides three areas:

- **Resident Assets:** Manage the LiquiFire resident assets
- **Render Cache:** Inspect or purge render cache items
- **Asset Cache:** Inspect or purge asset cache items

If the LiquiFire server is operating within a clustered environment, a fourth area appears:

- **Cluster:** Manages cluster member synchronization

Resident Assets

As with a typical filesystem, the LiquiFire asset pool can be organized via subdirectories, and provides typical file-manipulation tools such as rename, delete, view, upload, etc.

Within the Maintain section of Orb, the three Resident asset areas can be accessed by choosing the desired section. A typical view of the art section may present a pane similar to that in Figure 43.

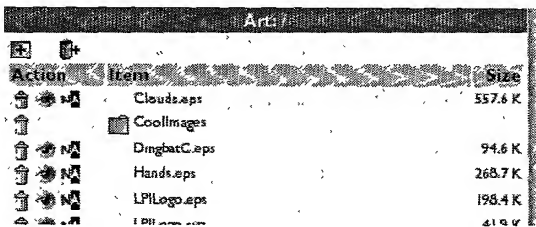





FIGURE 43. Resident Assets:Art





The top of the pane indicates which asset pool is being viewed, as well as the *path* or current folder; the root or '/' folder of the Art pool is being viewed above.

Above the list of files are displayed a suite of icons, representing the globally-accessable tools which may be used within this asset pool. The tools that may be available include:

Command	Description
	New Folder Create a new Folder (directory) within the currently displayed Folder.
	New File Create a new, empty file within the currently displayed Folder. Blank files may be subsequently edited via the edit command, see below.
	Upload File Upload a file or zip archive into the asset pool. Single files are simply added to the asset pool within the current Folder; zip archives' contents are un-zipped after the archive is transferred to LiquiFire.

Beneath the column headings appear a list of files and folders, comprising the contents of the Asset pool being viewed. Just as the above commands apply generally to

the asset pool and Folder being viewed, the following commands apply specifically to the adjacent file. These commands include:

Command	Description
	Delete Clicking this icon will, after confirmation, remove the adjacent file permanently from the asset pool.
	View Display the item in the asset pool for inspection
	Rename Change the name of the item in the asset pool
	Edit Edit the item in the asset pool

Cluster: Synchronize

When LiquiFire is operated as a cluster – cluster members have been added via “LiquiFire: Cluster” pane on page 30 – this pane becomes available.

This pane allows for manual invocation of the cluster member synchronization process, normally performed automatically by the LiquiFire master server on a periodic basis.

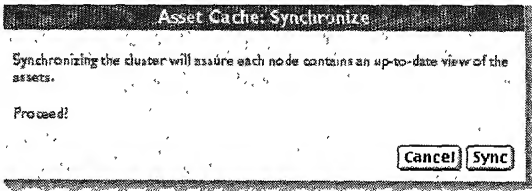


FIGURE 44. Asset Cache: Synchronize

Clicking the Sync button will initiate the cluster synchronization process. This process will assure that all cluster members have current copies of the most recent versions of any resident assets. Depending on the number of members in the cluster and the number of assets, this process may take some time to complete.

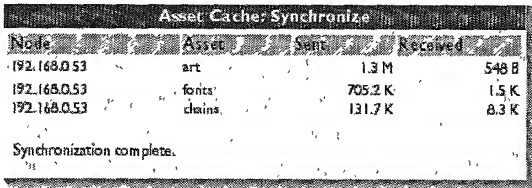


FIGURE 45. Asset Cache: Synchronize Complete

Upon completion, LiquiFire Orb will present the pane depicted in Figure 45, indicating which nodes participated in the synchronization process and how much data was transferred.

Render Cache: Flush Individual

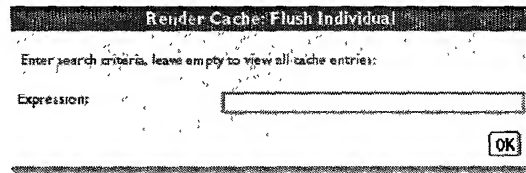


FIGURE 46. Render Cache: Flush Individual

As described in “Render Cache” on page 19, LiquiFire maintains a cached copy of each image it generates to increase performance. There may be situations where it is necessary to force LiquiFire to re-render an image within the *Render Cache*.

Selecting the *Flush Individual* menu item within LiquiFire Orb brings up the pane illustrated in Figure 46. This pane allows a LiquiFire user to query the render cache, based on a regular expression, and selectively re-render the selected image.

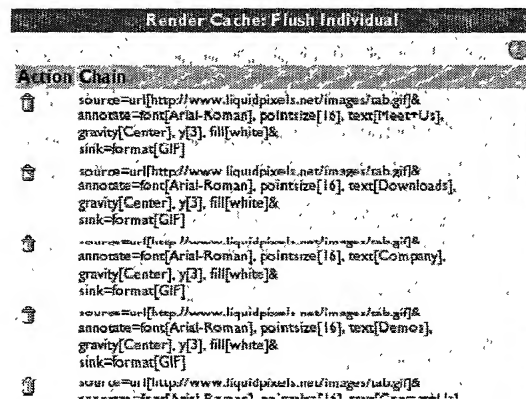



FIGURE 47. Render Cache: Flush Individual Item List

LiquiFire Orb will respond to the query by presenting a list of matching image chains which have corresponding rendered images currently resident in the Render Cache, similar to Figure 47. Clicking the delete icon  adjacent to a listed cache item will cause the currently stored rendered copy to be discarded and a new, fresh version to be generated in its place.

Render Cache: Flush All

The entire contents of the LiquiFire Render Cache may be permanently removed, in its entirety, via the *Flush All* command. After confirmation, LiquiFire Orb will remove the entire contents of the Render Cache. This process may take a moment to complete, during which time LiquiFire will be unavailable.

2017-01-10 10:10:10
LiquiFire Orb
v1.0.0
Render Cache
Flush All
Command
Executed
Successfully
LiquiFire
Orb
v1.0.0
Render Cache
Flush All
Command
Executed
Successfully
LiquiFire
Orb
v1.0.0
Render Cache
Flush All
Command
Executed
Successfully

Asset Cache:Validate

As described in “Asset Cache” pane on page 19, LiquiFire maintains a cache of all assets requested via URL within an image chain. While LiquiFire will periodically (See “LiquiFire: Cache” on page 32.) validate the assets in cache against the original remote data, it may be necessary to initiate this process manually.

Selecting the *Validate* menu item under the *Asset Cache* section will initiate this background process.

1. Open the LiquiFire application.
2. Click the **Asset Cache** tab in the left-hand pane.
3. Click the **Validate** button in the top right corner of the Asset Cache pane.
4. A progress bar will appear at the bottom of the Asset Cache pane, indicating the status of the validation process.
5. Once the process is complete, the progress bar will disappear and the Asset Cache pane will display the current state of the cache.

Asset Cache: Flush Individual

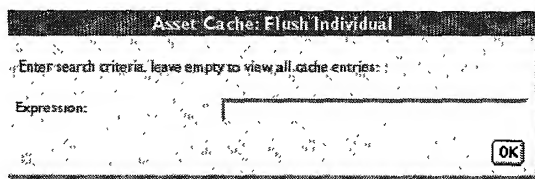


FIGURE 48. Asset Cache: Flush Individual

Similar to the Render Cache, selecting the *Flush Individual* menu item under the Asset Cache section within LiquiFire Orb brings up the pane illustrated in Figure 48. This pane allows a LiquiFire user to query the asset cache, based on a regular expression, and selectively remove the selected asset.

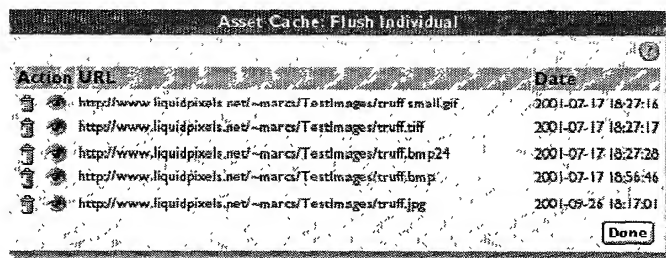


FIGURE 49. Asset Cache: Flush Individual Item List

LiquiFire Orb will respond to the query by presenting a list of matching assets (images, typefaces, color profiles, or chains) which are resident in the Asset Cache, similar to Figure 49. Clicking the delete icon adjacent to a listed cache item will cause the currently stored copy to be discarded. Clicking the view icon adjacent to a listed cache item will display that item.

Asset Cache: Flush All

The complete contents of the LiquiFire Asset Cache may be permanently removed, via the *Flush All* command under the Asset Cache section. After confirmation, LiquiFire Orb will remove the entire contents of the Asset Cache. This process may take a moment to complete.

1. In the LiquiFire Orb, click on the Asset Cache section.
2. Click on the Flush All button.
3. A confirmation dialog will appear. Click on the Yes button.
4. The Asset Cache will be flushed and the contents removed.
5. The Asset Cache section will be updated with the new contents.

Tools

Tools: Explorer

LiquiFire Explorer provides a simple, yet powerful way to develop LiquiFire image chains within an assisted, interactive framework. As well, for efficiency, Explorer is integrated into other areas of Orb.

LiquiFire Explorer encompasses only a single pane within Orb, illustrated in Figure 50:

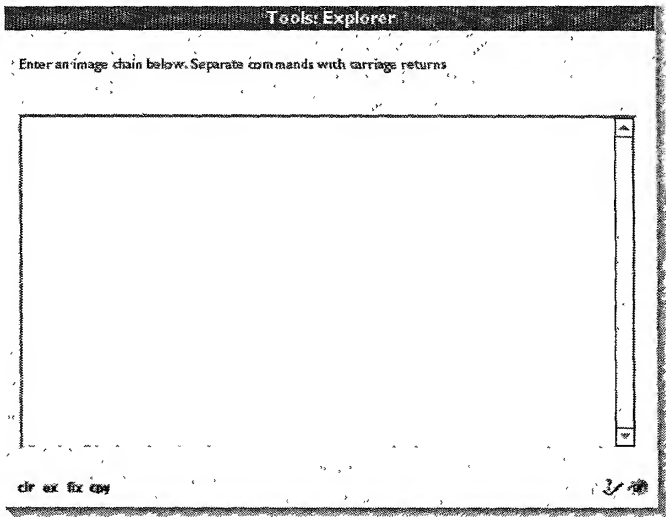






FIGURE 50. Tools: Explorer

Within this pane are two sections: A large text edit box, and a button bar, below. Image chain design and editing takes place within the edit box while the button bar encompasses Explorer's command set. The commands available are:

Command	Description
clr	Cklear Clears the contents of the the chain design area
ex	Examples Presents the Asset pool Folder containing example chains
fix	Fixup When pasting a chain from a web page into Explorer, this command can be used to convert the chain into an editable form, as well as to clean up common mistakes such as repeated & characters, etc.

Command	Description
	Copy Copies the chain in the design area into the 'chainboard'
	Paste Pastes the chain on the 'chainboard' into the design area
	Check Performs syntax checking and validation on the chain in the design area.
	View Submits the chain in the design area to the LiquiFire server (or cluster) configured in the Config area of LiquiFire Orb for preview.

Chains are entered into the design area as a list of separate commands, separated by carriage returns. It is unnecessary to perform any X-URL-ENCODING of the chain in the design area, as Explorer will properly escape the chain before submission to LiquiFire for rendering when View is selected. Figure 51 depicts a chain properly formed for Explorer.

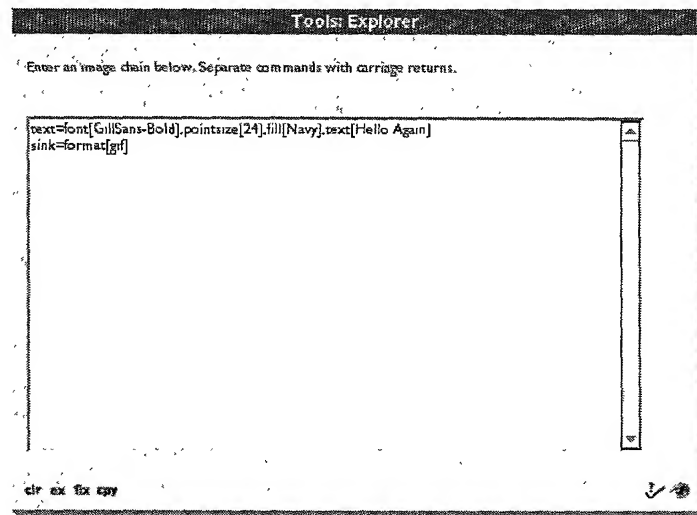


FIGURE 51. Example Explorer Chain

Notice in this example, the space in the text argument is written simply as a space, not as the X-URL-ENCODED %20 or shorthand '+' – Explorer handles this translation for you automatically.



Clicking on the *View* icon  will open a new browser window¹ containing a rendered version of the chain in the design area, if successful, or an appropriate error message, if unsuccessful.



FIGURE 52. Explorer Preview Window

Clicking the *Check* icon  will open a new browser window containing a syntax-highlighted form of the chain in the design area, along with any detected syntax or validation errors detected. This can be immensely useful when developing image chains.

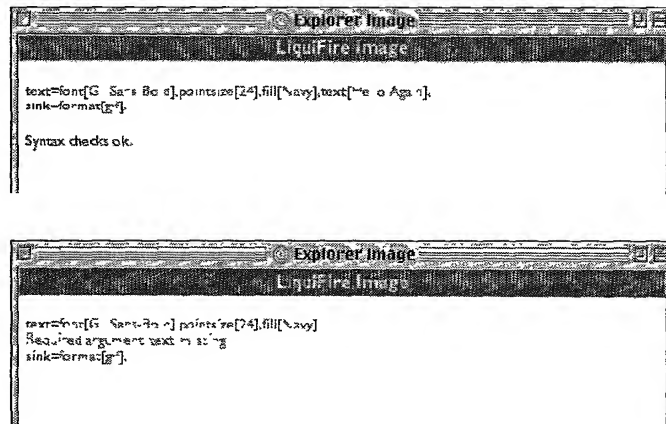


FIGURE 53. Explorer Check Windows

1. Using the *Preferences* menu item under the *Tools* view, you may optionally choose to have image previews appear in the same browser window as Explorer.

Tools: Font Map

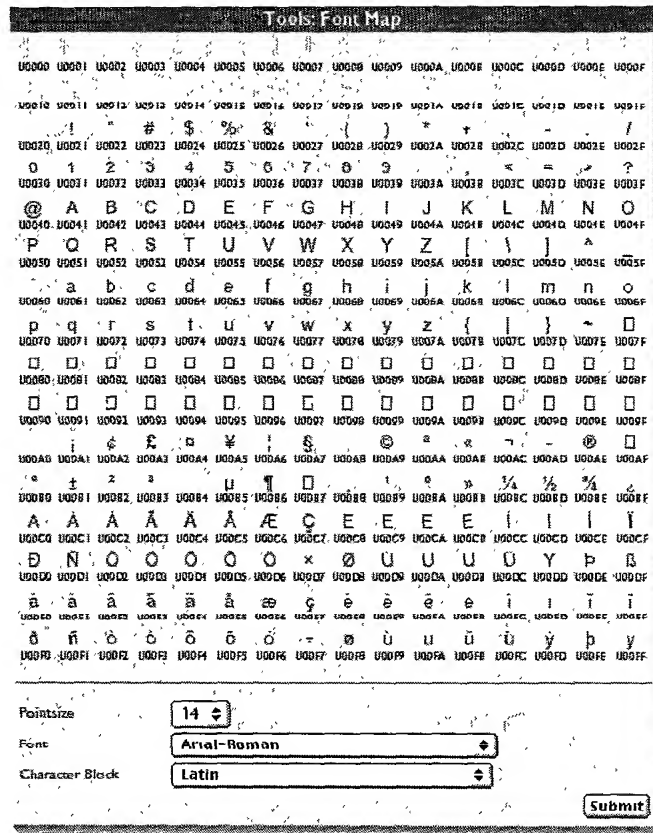


FIGURE 54. Tools: Font Map

LiquiFire allows for access to full font character sets via Unicode character expression. While this capability allows the user to express any character within a request, the vast Unicode character definitions still need to be known to properly identify the character desired.

The Font Map tool displays a specified section of the Unicode character definitions as a table of glyphs (characters), rendered in a specified installed typeface.

Tools: Chain Cipher

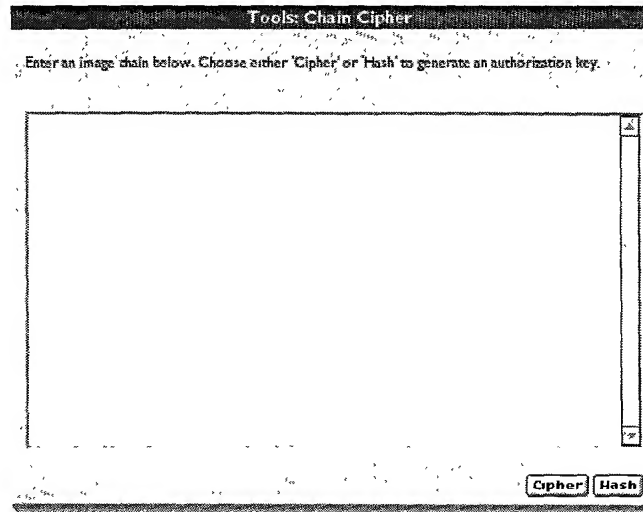


FIGURE 55. Tools: Chain Cipher

As discussed in “Security” on page 17, LiquiFire allows for two modes to restrict access to a LiquiFire server: Referring Host, and Keyed Requests. For the Keyed Requests method, each chain is augmented with a request-specific key, without which the request will not render. Further, since this key is generated from the request itself, any alterations made to the request will cause the chain to not render.

Within the Keyed Requests mechanism, there are two types of keys that may be generated. A simple hash and a more sophisticated cryptographic cipher. The cipher method is available for the truly paranoid.

This tool will generate the key for a particular image chain entered above. As in Explorer, chains are entered as separate lines.

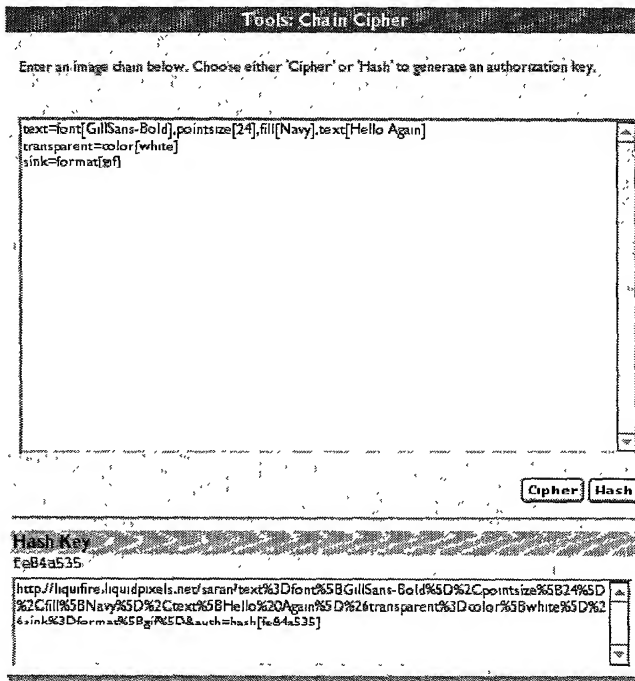


FIGURE 56. Tools: Chain Cipher Hash

When either the Hash or Cipher buttons are pressed, as illustrated in Figure 56, an encoded version of the chain will appear in a new text area below the original chain within the pane. This new version will additionally have the proper key attached.

Tools: Preferences

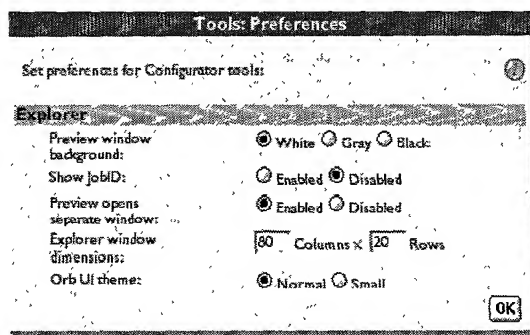


FIGURE 57. Tools: Preferences

LiquiFire Orb has a few preferences which may be controlled by each individual Orb user. These preferences are maintained via a browser cookie, and will be persistent within a particular browser as long as the cookie exists.

Field	Description
Preview window background	When developing image chains which result in transparent images, it may be desirable to control the background color on which the image is displayed. This option allows you to set the background color of the view window.
Show JobID	When debugging a complex chain, this option may be enabled to cause LiquiFire to render the Job ID onto the rendered image. This ID can then be used within the Access Log section within the Monitor view to see detailed job processing information.
Preview opens separate window	When enabled, LiquiFire Orb will display the rendered image in a new separate window.
Explorer window dimensions	Allows you to set the size of the Explorer pane's design area.
Orb UI Theme	Allows you to choose from any of the installed UI themes for the entire Orb environment.

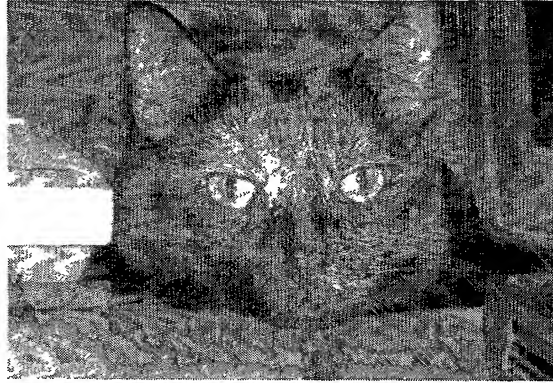
This chapter contains several complete examples of LiquiFire imaging, represented as HTTP requests.

They may be simply illustrative, or may serve as a starting point for further chain development and experimentation.

Format Conversion

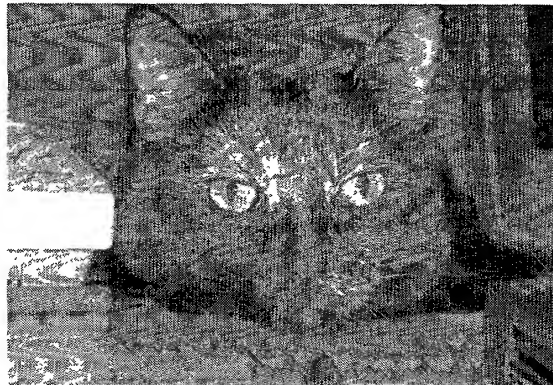
Using LiquiFire, a single image can easily be re-purposed on-demand. Here, the image, a JPEG on the server, is delivered as JPEG:

```
source=url[http://www.liquidpixels.net/images/truff.jpg]&  
scale=size[50%]&  
sink=format[jpg]
```



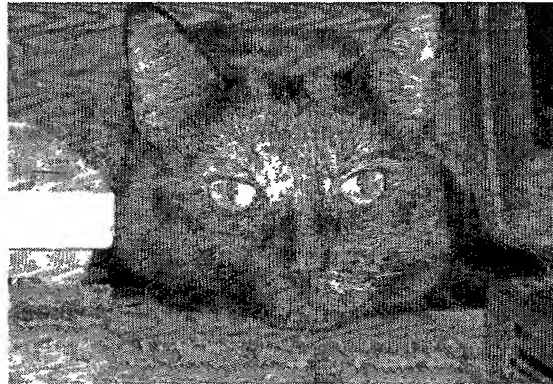
and now as GIF:

```
source=url[http://www.liquidpixels.net/images/truff.jpg]&  
scale=size[50%]&  
sink=format[gif]
```



Some browsers can display BMP format images:

```
source=url[http://www.liquidpixels.net/images/truff.jpg]&  
scale=size[50%]&  
sink=format[bmp]
```



And, as needs and formats evolve, re-purposing existing image assets is as simple as changing the URL. Formats like Adobe PDF, Group 3 Facsimile, and Tagged Image File Format (TIFF) are supported:

```
source=url[http://www.liquidpixels.net/images/truff.jpg]&  
scale=size[50%]&  
sink=format[pdf]
```

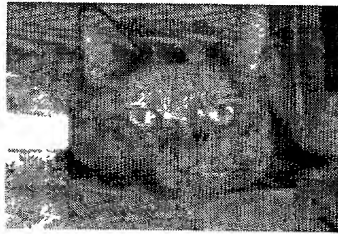
```
source=url[http://www.liquidpixels.net/images/truff.jpg]&  
scale=size[50%]&  
sink=format[g3fax]
```

```
source=url[http://www.liquidpixels.net/images/truff.jpg]&  
scale=size[50%]&  
sink=format[tiff]
```

Image Scaling

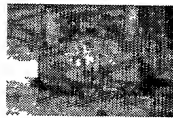
The same high-resolution image asset can be presented as a scaled thumbnail:

```
source=url[http://www.liquidpixels.net/images/truff.jpg]&  
scale=size[128]&  
sink=format[jpg]
```



...or as a tiny image icon:

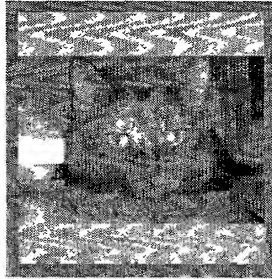
```
source=url[http://www.liquidpixels.net/images/truff.jpg]&  
scale=size[64]&  
sink=format[jpg]
```



Complex Scaling

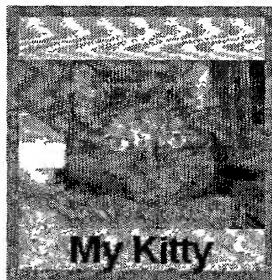
Scaling in LiquiFire can be specified in several ways. Here, we use the 'fit to square' method, asking that the source image be scaled such that it fits exactly within a 128×128 pixel square. This approach allows images of any aspect-ratio to be easily handled, letting LiquiFire deal with the complex calculations necessary. And it's so simple to add a border too:

```
source=url[http://www.liquidpixels.net/images/truff.jpg],
name[img]&
scale=size[128]&
blank=width[128],height[128],color[grey80],name[bg]&
border=width[3],height[2],color[slateblue]&
composite=compose[Over],image[img],gravity[Center]&
sink=format[jpg]
```



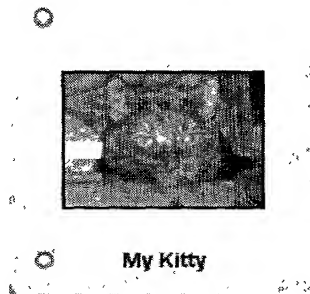
Perhaps the thumbnail should be labeled:

```
source=url[http://www.liquidpixels.net/images/truff.jpg],
name[img]&
scale=size[128]&
blank=width[128],height[128],color[grey80],name[bg]&
border=width[2],height[2],color[slateblue]&
composite=compose[Over],image[img],gravity[Center]&
annotate=text[My+Kitty],font[Arial-Bold],
pointsize[14],gravity[South],y[-5]&
sink=format[jpg]
```



And of course, the background could be an image as well:

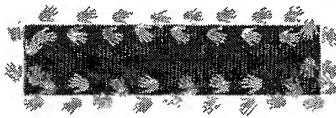
```
source=url[http://www.liquidpixels.net/images/truff.jpg],
name[img]&
scale=size[128]&
border=width[2],height[2],color[black]&
source=url[http://www.liquidpixels.net/images/SlideMount.jpg],
name[mount]&
scale=size[200]&
composite=compose[Over],image[img],gravity[Center]&
annotate=text[My+Kitty],font[Arial-Bold],pointsize[14],
gravity[South],y[-15]&
sink=format[jpg]
```



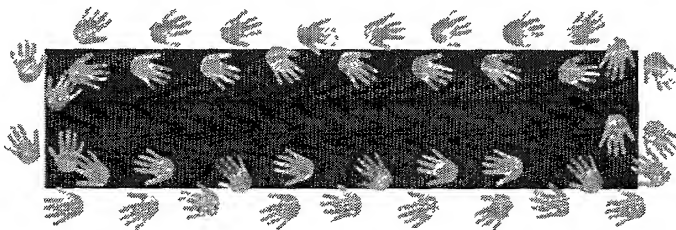
Vector-based Formats

Source images in vector formats, such as Encapsulated PostScript (EPS), PostScript (PS), or Scalable Vector Graphics (SVG) are supported by LiquiFire. Since the conversion to pixels is not done until a pixel-manipulation command is encountered, scaling or rotation can be done without introducing any artifacts, or jaggies, in the resulting image:

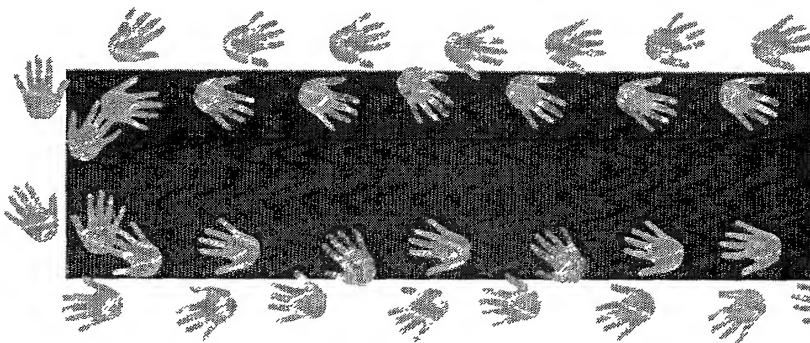
```
source=url[file:Hands.eps]&  
sink=format[GIF]
```



```
source=url[file:Hands.eps]&  
scale=size[200%]&  
sink=format[GIF]
```



```
source=url[file:Hands.eps]&  
scale=size[300%]&  
sink=format[GIF]
```



Dynamic Graphic Elements

By using LiquiFire to generate images on-demand, repetitive tasks are no longer needed, saving valuable time and resources. Changing design elements such as text, typeface, size, color, or position no longer requires a trip to an image editing package. Even foreign language translation is merely a URL change.

```
source=url[file:tab.eps]&
annotate=font[Arial-Roman],pointsize[9],text[Click+Me],
gravity[Center],fill[black]&
sink=format[GIF]
```



```
source=url[file:tab.eps]&
annotate=font[Arial-Bold],pointsize[9],text[No+Me],
gravity[Center],fill[black]&
sink=format[GIF]
```



```
source=url[file:tab.eps]&
hue=value[10]&
annotate=font[Arial-Roman],pointsize[9],text[Click+Me],
gravity[Center],fill[black]&
sink=format[GIF]
```



```
source=url[file:tab.eps]&
hue=value[40]&
annotate=font[Arial-Roman],pointsize[9],text[Click+Me],
gravity[Center],fill[black]&
sink=format[GIF]
```



Complex Calculations

Here, a complex LiquiFire request is encapsulated in a stored chain (See “Stored Chains” on page 8.). This allows dynamic information such as the region, color, target date, and holiday to be specified in the URL, while maintaining the look and logic of the banner in a small file on your site:

```
set=key[a],value[nyc]&
set=key[color],value[aquamarine]&
set=key[date],value[2/14/2002]&
set=key[hday],value[Valentine's+Day]&
load=url[file:vdaybanneradj.saran]
```

(and the loaded file vdaybanneradj.saran contains:)

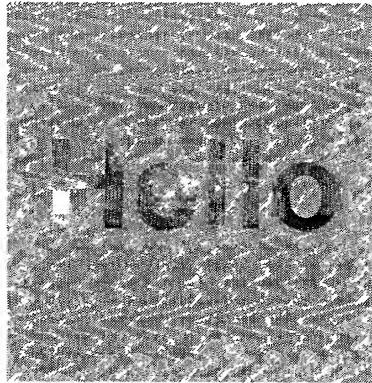
```
regexcase=key[global.a],cases[nyc|sfo|bos],
  values[nycbg.jpg|sfobg.jpg|bosbg.jpg],name[bg]&
regexcase=key[global.a],cases[nyc|sfo|bos],
  values[v1.gif|v2.gif|v1.gif],name[heart]&
regexcase=key[global.a],cases[nyc|sfo|bos],
  values[v1b.gif|v2b.gif|v2.gif],name[hearto]&
source=url[http://www.liquidpixels.net/images/global.bg],
  name[bg]&
source=url[http://www.liquidpixels.net/images/
global.heart],
  name[hon]&
source=url[http://www.liquidpixels.net/images/
global.hearto],
  name[hoff]&
select=name[bg]&
fontmetrics=text[global.vday],font[Dominican],pointsize[36]
&
attribute=name[bg],key[delay],value[30]&
annotate=text[Only],font[Dominican],pointsize[22],
  fill[global.color],y[35],x[10]&
annotate=text[days+left+till+global.hday],font[Dominican],
  pointsize[22],fill[global.color],y[35],x[117]&
countdown=target[global.date],key[vday]&
annotate=text[global.vday],font[Dominican],pointsize[36],
  fill[global.color],y[36],x[(95-bg.metrics.x/2)]&
composite=compose[over],image[hoff],x[386]&
addframe=image[hon],delay[30],x[386],trans[%23000000]&
optimize&
sink=format[gif],loop[forever]
```



Complex Imaging

Complex imaging tasks are possible with LiquiFire, just as in any desktop imaging application. Here, a mask image is created from the word 'Hello,' through which the cat image is revealed:

```
blank=width[400],height[400],name[c],color[skyblue]&
text=text[Hello],pad[10],bgcolor[white],fill[black],
font[Arial-Bold],pointsize[100],gravity[Center],name[t]&
source=url[http://www.liquidpixels.net/images/truff.jpg],
name[cat]&
scale=width[t.width],height[t.height]&
attribute=key[matte],value[true]&
composite=compose[replacematte],image[t]&
select=name[c]&
composite=compose[over],image[cat],x[(c.width/2-t.width/
2)],
y[(c.height/2-t.height/2)]&
sink
```



Simple Text

While HTML formatting capabilities are limiting, LiquiFire can create graphic text elements on-demand, allowing your design intent – typeface, color, size – to be preserved. All without the time and effort of creating a pile of graphics in a desktop application.

```
text=font[Arial-Italic],pointsize[24],fill[DarkGreen],
text[Hello+Again]&
sink=format[gif]
```

Hello Again

Text can be rendered on a transparent background, if the format supports transparency:

```
text=font[Arial-Italic],pointsize[24],fill[DarkGreen],
text[Hello+Again]&
transparent=color[%23FFFFFF]&
sink=format[gif]
```

Hello Again

...any typeface, any size, any color:

```
text=font[Bud+Hand],pointsize[24],fill[DarkBlue],
text[Hello+Again]&
sink=format[gif]
```

Hello Again

Text can be aligned to an image:

```
blank=width[300],height[300],color[DarkBlue]&  
annotate=font[Bud+Hand],pointsize[24],fill[Yellow],  
text[Hello+Again],gravity[East]&  
sink=format[gif]
```



...or fit to the size of an image:

```
blank=width[300],height[300],color[DarkBlue]&  
annotate=font[Bud+Hand],pointsize[Fit],fill[Yellow],  
text[Hello+Again]&  
sink=format[gif]
```



Source Commands **blank**

Aliases

new

Description

Creates a new image and adds it to the image pool. A new, solid image is created at the size specified, filled with the specified background color.

Arguments

Argument	Type	Description
name	string	Optional. The name of the image within the image pool. If omitted, the images is assumed to be the current image.
width	number	Required. The width, in pixels, of the new image
height	number	Required. The height, in pixels, of the new image
color	color	Default: white The color for the new image

source

Aliases

src

Description

Acquires an image from the specified source and places it in the image pool for use later in a request. Images may be acquired from any of the supported sources, and may be in any of the supported formats.

Images can be acquired from `http://`, `ftp://`, or `file:` sources. Images retrieved from remote sources are cached within LiquiFire.

Images are maintained in LiquiFire's cache once retrieved; caching can be prevented by specifying the `nocache[true]` argument to the source command. Cache characteristics can be adjusted via the LiquiFire Orb. See "LiquiFire: Cache" on page 32.

Arguments

Argument	Type	Description
url		Required. Describes the source for the image data. URLs can be any valid form for the method indicated. For HTTP or FTP, username and password may be supplied, if required as illustrated in the examples below
name	string	Optional. The name of the image within the image pool. If omitted, the images is assumed to be the current image.
nocache	true/false	Default: False If True, the image is not stored in the LiquiFire caching system and will subsequently re-retrieved from the url specified in later requests.

Example

```
source=url[http://www.liquidpixels.net/TestImages/truff.jpg]&  
sink
```

Images may be directly retrieved from an FTP server, as well. In this example, the user `ausser` and password `mypassword` are used to access the FTP server at `ftp.liquidpixels.net`.

```
source=url[ftp://ausser:mypassword@ftp.liquidpixels.net/  
    TestImages/Erika.jpg]&  
scale=size[400]&  
sink
```

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select

Description

Makes the named image the current image (` _ '), replacing the previous current image. Can also be used to select a single frame from a multiple-frame image for manipulation.

Arguments

Argument	Type	Description
name	string	Required. The name of the image within the image pool to be selected as the current image.
frame	number	Optional. If specified, the frame indicated is identified as the active frame, and will solely be affected by subsequent image manipulations. To re-select the entire image, use the select command without the frame argument specified. Frames are counted from 0.

Example

We add 2 images into the image pool. First, a large TIFF image, `Fence.tif` (3340 × 2259; 22.6MB) given the name 'fence', and second a JFIF image, `truff.jpg`, which is left unnamed (as the current image). The select command makes the `Fence.tif` image the current image allowing the subsequent scale and sink commands to operate on it.

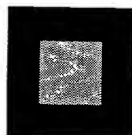
```
source=url[http://www.liquidpixels.net/images/Fence.tif],
name[fence]&
source=url[file:/home/marcs/TestImages/truff.jpg]&
select=name[fence]&
scale=size[300x300]&
sink=format[jpeg]
```



Example

Given an eight frame GIF-89 (animated GIF) image, select and display frame number 2. Notice that while selecting a frame from an image, the image name must be supplied:

```
source=url[http://www.liquidpixels.net/TestImages/colors.gif]&
select=name[_],frame[2]&
sink=format[gif]
```



Sink Commands

sink

Description

Sends the resulting image to the caller.

Arguments

Argument	Type	Description
format	<i>any format supported by LiquiFire</i>	Default: JPEG (JFIF). Determines the format of the returned image.
quality	number	Optional for JPEG-compressed formats only. Determines the JPEG 'Q' setting
loop	number	Optional for GIF-89. Sets the number of loops for animated GIF (GIF-89) images

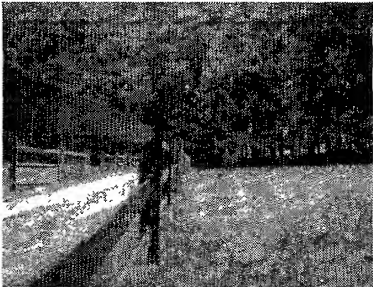
Example

The sink command directs LiquiFire to send the image to the client. In the 5 following examples, the request is identical except the sink command, with the sink command used for each image printed below the result.

```
source=url[http://www.liquidpixels.net/images/Fence.tif],
name[fence]&
scale=size[600x600]&
sink=format[jpeg],quality[5]
```



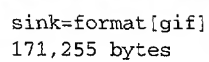
sink=format[jpeg],quality[5]
13,164 bytes



sink=format[jpeg],quality[25]
26,910 bytes



```
sink=format[jpeg],quality[100]
363,280 bytes
```



Imaging
Commands

addframe

Description

Adds the specified image as a new frame of the current image. The sub-image location, disposal, transparency, and delay characteristics for the added frame can be controlled via optional arguments.

Arguments

Argument	Type	Description
image	string	Required. The name of the image in the pool to add as a new frame
x	number	Required. The horizontal location of the top corner of the new frame, relative to the current image's left edge
y	number	Required. The vertical location of the top corner of the new frame, relative to the current image's top edge
trans	color	Optional for GIF-89 and PNG If specified, the color is treated as transparent
delay	number	Optional for GIF-89 and PNG Determines the delay in tenths of seconds between frames when the image is viewed as an animation.
dispose	nonelasisl backgroundl previous	Default: asis for GIF-89 Determines the GIF disposal method after the frame is displayed. asis: the frame stays in place after display background: the frame is treated as the background for the subsequent frame previous: the previous frame is displayed after this one none: unspecified; continuous animation frame

Example

In this example, we will create a simple four frame animation. On a black background image, we will add three frames, each at a new location. The disposal is set to background, causing the black background to be the basis for subsequent frames, rather than leaving the frame in place.

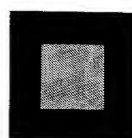
```
blank=width[100],height[100],color[black],name[bg]&
blank=width[50],height[50],color[red],name[r]&
blank=width[50],height[50],color[green],name[g]&
blank=width[50],height[50],color[blue],name[b]&
select=name[bg]&
attribute=name[bg],key[delay],value[70]&
addframe=image[r],delay[10],x[0],y[25],dispose[background]&
addframe=image[g],delay[10],x[25],y[25],dispose[background]&
addframe=image[b],delay[10],x[50],y[25],dispose[background]&
optimize&
sink=format[gif],loop[forever]
```



frame 1



frame 2



frame 3



frame 4

addprofile

Description

Embed or apply an ICC Color profile to an image.

If the image does not contain an embedded color profile, `addprofile` will mark the image with the source profile specified. If a profile is embedded, `addprofile` will perform the color transformation into the result colorspace specified by the profile given, and embed the profile in the image.

Arguments

Argument	Type	Description
url	url	Required. The url of the ICC profile to add. Color profiles referenced with the <code>file:</code> method must reside within the <code>art</code> directory on LiquiFire. See "Resident Assets" on page 46.
intent	Saturation Perceptual Absolute Relative	Optional. If present, instructs the color management engine as to the color matching intent desired.

Example

Certain file formats can represent images in colorspace which are unsuitable for output. For example, JFIF images can be represented in CMYK colorspace, resulting in strange patterns if displayed on a web browser. By embedding a CMYK colorspace source profile and adding a suitable RGB colorspace profile, the image can be displayed.

```
source=url[http://www.liquidpixels.net/images/colors.jpg]
addprofile=url[file:profiles/GenericCMYK.icm]
addprofile=url[file:profiles/sRGB.icm]
sink
```

See

"removeprofile" on page 131.

Fill a region of an image's alpha channel. Since alpha channels are monochrome, the channel is filled with the intensity of the color specified.

Argument	Type	Description
x	number	Required. The horizontal location at which to begin pouring ink.
y	number	Required. The vertical location at which to begin pouring ink.
color	color	Required. The color to flood the image.

See “fill” on page 114.

annotate

Description

Draw text on an image.

Text may contain Unicode characters, expressed as `Unnnn`, where `nnnn` is a valid Unicode character value, or as extended characters, expressed as `\nnn`, where `nnn` is a valid ascii-extended character code. Unicode character codes may be explored using the *Font Map* tool in LiquiFire Orb.

Multiple lines may be imaged together; line breaks may be expressed by `\n` within the text.

Additional typefaces can be added to LiquiFire via FTP or LiquiFire Orb, or via URL.

Arguments

Argument	Type	Description
text	string	Required. The text to be imaged
font	fontname	Required. The name or URL of the typeface in which to image the text. If a URL is provided, the typeface is retrieved and cached in the LiquiFire asset pool.
pointsize	number fit	Required. Either the size, in points, of the text to be rendered. or the keyword <code>fit</code> , indicating the text size should be chosen such that the text fits within the size of the current image. Additionally, width and height can be specified to specify alternative boundaries to the pointsize.
stroke	color	Optional. If present, the text is outlined in this color.
fill	color	Default: Black. Determines the color for the text
box	color	Optional. If present, fills behind the text with a solid box in the specified color

Argument	Type	Description
gravity	NorthWest	Optional.
	North	Determines the origin from which the baseline of the text is positioned, relative to the current image '_ '.
	NorthEast	
	East	
	SouthEast	
	South	
	SouthWest	
	West	
	Center	
alignto	TopLeft	Optional.
	TopCenter	If present, along with x and y arguments, the text is aligned at the point specified, aligned as specified to that point.
	TopRight	
	Left	
	Center	
	Right	
	BottomLeft	
	BottomCenter	
	BottomRight	
x	number	The horizontal offset for the text baseline. If a gravity is specified, the origin for x and y is based on that location. Otherwise x and y specify absolute location within the image
y	number	The vertical offset for the text baseline. See x for details.
width	number	Optional.
		If pointsize is fit and this argument is present, the pointsize is selected such that the rendered text is no wider than width pixels.
height	number	Optional.
		If pointsize is fit and this argument is present, the pointsize is selected such that the rendered text is no taller than height pixels.
rotate	number	Optional.
		If present, text will be drawn rotated the specified number of degrees clockwise.

Example

A simple example: Notice the text is barely visible at the top-left of the image. Since no x, y, or gravity was specified, the baseline of the text is located at 0, 0 – resulting in only the portion of the text below the baseline to be visible. The baseline's position within a typeface is determined by the typographer.


```
blank=width[50],height[50]&  
annotate=text[Hello],font[Arial-Roman],pointsize[12],y[10]&  
sink
```

Hello

Example

With the addition of the gravity argument, the text is centered within the image.

```
blank=width[50],height[50]&  
annotate=text[Hello],font[Arial-Roman],pointsize[12],  
gravity[Center]&  
sink
```

Hello

Example

Text can be rendered at any angle. Here, we anchor the coordinates to the top center of the image with the gravity argument, then shift the text downward by 10 pixels with the y argument:

```
blank=width[50],height[50]&  
annotate=text[Hello],font[Arial-Roman],pointsize[12],  
gravity[North],rotate[45],y[10]&  
sink
```

Hello

attribute

Description

Sets (or clears) an image-metadata value. See Appendix, "Image Metadata Fields" on page 191 for a list of image-metadata fields and their semantics.

Arguments

Argument	Type	Description
key	string	Required. The name of the metadata field to be adjusted
value	any	Optional. If present, contains the new value for the field specified. If omitted, the contents of the field are cleared to the default value specific to the field.
name	string	Optional. If present, the attributes of the named image are altered.

Example

The attribute command is used here to set the inter-frame delay for the newly created background image to 30 tenths of a second.

```
blank=width[50],height[50],color[black],name[bg]&
blank=width[25],height[25],color[red],name[r]&
select=name[bg]&
attribute=name[bg],key[delay],value[30]&
addframe=image[r],delay[30],x[12],y[12]&
optimize&
sink=format[gif],loop[forever]
```



frame 1



frame 2

bevel

Description

Applies a bevel effect to the edges of the image.

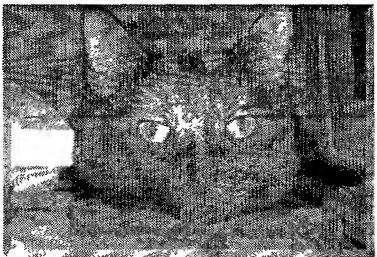
Arguments

Argument	Type	Description
width	number	Default: 5 The width, in pixels, of the left and right bevel edges
height	number	Default: 5 The height, in pixels, of the top and bottom bevel edges
raise	Boolean	Default: false If true, shading on the bevel's edges is chosen to produce a raised appearance. Otherwise, a sunken bevel appearance is used.

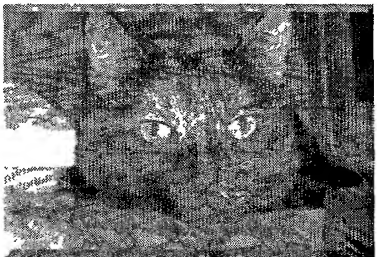
Example

Some variations on the below example appear in the following table.

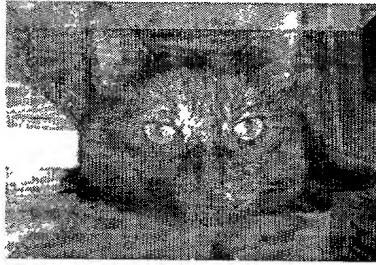
```
source=url[http://www.liquidpixels.net/TestImages/truff.jpg]&
scale=size[300x300]&
bevel&
sink
```



bevel



bevel=raise[true]



```
bevel=raise[true],height[20],width[20]
```

blur

Description

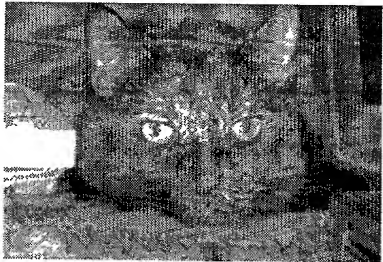
Blurs an image using a speed-optimized Gaussian blur. See “gblur” on page 123.

Arguments

Argument	Type	Description
width	number	Required. The extent of the blurring from any point.
sigma	number	Default: 1.0 The amount of blurring to apply.

Example

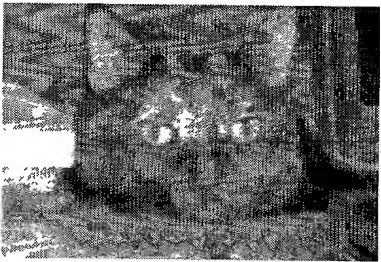
```
source=url[http://www.liquidpixels.net/TestImages/truff.jpg]&  
scale=size[300x300]&  
blur=width[2],sigma[1.0]&  
sink
```



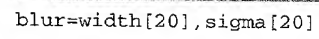
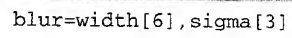
unfiltered



blur=width[2],sigma[1.0]



blur=width[4],sigma[1.0]



border

Description

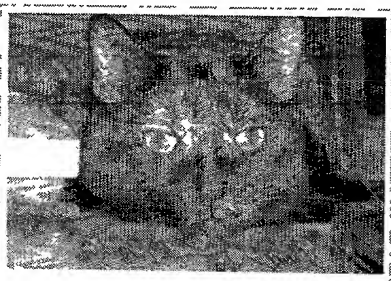
Applies a solid or tiled border to an image.

Arguments

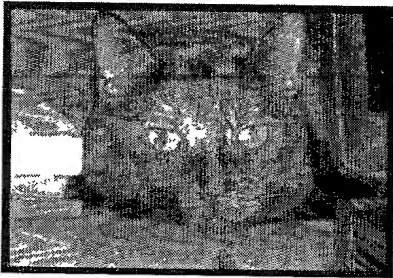
Argument	Type	Description
width	number	Required. The width, in pixels, of the border
height	number	Required. The height, in pixels, of the border
color	color	Default: white The color of the border. See Appendix B: Color Name Definitions for defined color names.

Example

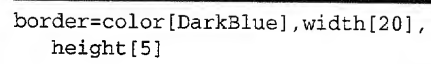
```
source=url[http://www.liquidpixels.net/TestImages/truff.jpg]&  
scale=size[300x300]&  
border&  
sink
```



border=width[5],height[5]



border=color[DarkBlue],
width[5],height[5]



brightness

Description

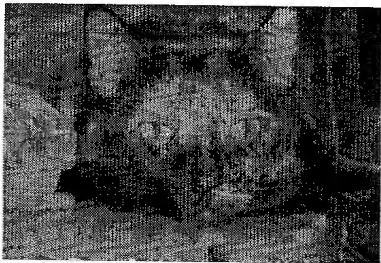
Adjusts brightness of an image

Arguments

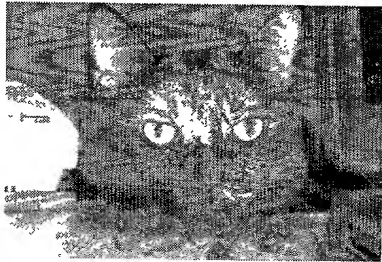
Argument	Type	Description
value	number	Required. The amount of brightness adjustment to apply. Brightness is represented as a percentage; brightness of 0 renders the image black, 100 results in no-change, and values greater than 100 increase brightness.

Example

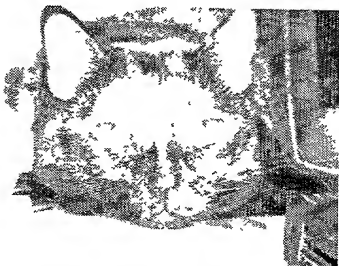
```
source=url[http://www.liquidpixels.net/~marcs/TestImages/
truff.jpg]&
scale=size[300x300]&
brightness=value[50]&
sink=quality[100]
```



brightness=value[50]



brightness=value[120]



brightness=value[300]

colorize

Description

Tints the image with the color specified.

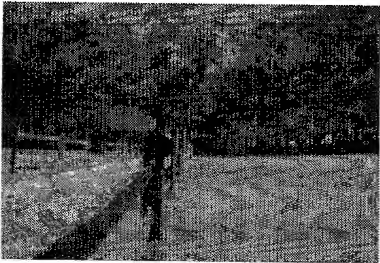
Arguments

Argument	Type	Description
fill	color	Required. The color with which to tint the image.
opacity	number	Default: 100 Determines the amount of colorization to occur. Lower values permit most of the original image to show through, while higher values result in an image approaching a solid fill color.

Example

Colorize can be used as a special effect. Here, the fence image is colorized 25% with a strong blue tint:

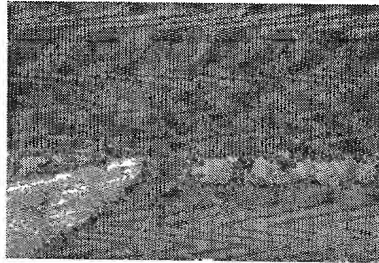
```
source=url[http://www.liquidpixels.net/images/Fence.tif]&
colorize=fill[blue],opacity[25]&
sink
```



Example

Colorize can also be used to tint monochrome images. By first changing this image to grayscale by decreasing the saturation to 1, then applying a brown tint with colorize, we achieve the Sepiatone effect of aged photographs.

```
source=url[http://www.liquidpixels.net/images/Fence.tif]  
saturation=value[1]  
colorize=fill[tan3],opacity[35]  
sink
```



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composite

Description

Composition, or layering, allows two images to be combined together. Two images are involved in composition: the current image and a new source image (the layered image) specified by the image argument. During the composition process, alpha channels (transparency information) in both the current image and the layered image may be involved in the combination process, depending on which compose operator is used.

The two images are combined, pixel by pixel, according to the specific compose operator specified. The over compose operator is probably most commonly used; it performs image layering, blending the layered image to the current image based on the current image's alpha channel.

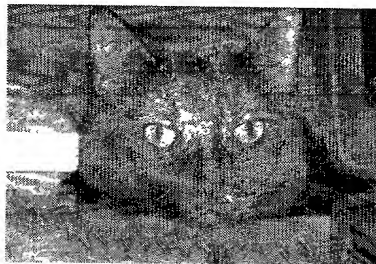
Arguments

Argument	Type	Description
compose	Over Xor	Required.
	Add Subtract	The type of composition to perform.
	Bumpmap	
	Replace	
	ReplaceRed	
	ReplaceGreen	
	ReplaceBlue	
	ReplaceAlpha	
	Blend	
	Displace	
image	string	Required.
		The name of the image in the image pool to use as the layered image.

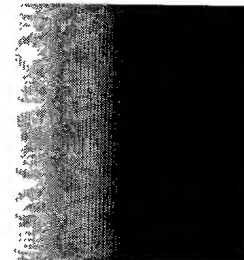
Argument	Type	Description
x	number	Optional. The horizontal offset, in pixels, of the layered image relative to the left edge of the current image.
y	number	Optional. The vertical offset, in pixels, of the layered image relative to the top edge of the current image.
gravity	NorthWest North NorthEast East SouthEast South SouthWest West Center	Optional. Determines the origin from which the origin of the composite image is positioned, relative to the current image's ' '.
opacity	number	Optional. [nyi] Percentage of opacity to use during composition.

Examples

In the following examples, these two images and corresponding alpha channels are used:



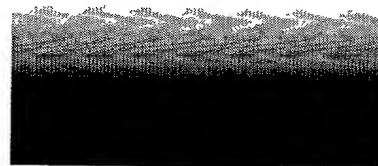
Layered Image



Layered Image's Alpha Channel



Current Image



Current Image's Alpha Channel

These sample images are composited together below using the indicated compose operator.



Over

Renders the layered image, masked by the layered image's inverted alpha channel, layered with the current image, masked by the layered image's alpha channel

```
red      = ( L[r] * (255 - L[α]) + C[r] * L[α] ) * 1/255
green    = ( L[g] * (255 - L[α]) + C[g] * L[α] ) * 1/255
blue     = ( L[b] * (255 - L[α]) + C[b] * L[α] ) * 1/255
alpha    = ( L[a] * (255 - L[α]) + C[a] * L[α] ) * 1/255
```



Atop

Renders the layered image masked by the current image's alpha channel, combined with the current image, masked by the layered image's alpha

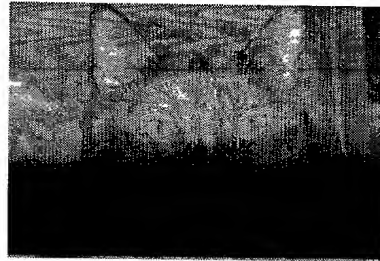
```
red      = ( L[r] * C[α] + C[r] * ( 255 - L[α] ) ) * 1/255
green    = ( L[g] * C[α] + C[g] * ( 255 - L[α] ) ) * 1/255
blue     = ( L[b] * C[α] + C[b] * ( 255 - L[α] ) ) * 1/255
alpha    = ( L[α] * C[α] + C[α] * ( 255 - L[α] ) ) * 1/255
```



In

Renders the layered image, masked by the current image's alpha channel

```
red      = L[r] * (255 - C[α]) * 1/255
green    = L[g] * (255 - C[α]) * 1/255
blue     = L[b] * (255 - C[α]) * 1/255
alpha    = L[a] * (255 - C[α]) * 1/255
```



Out

Displays the layered image, masked by the current image's inverted alpha channel

```
red      = ( L[r] * C[α] ) * 1/255
green    = ( L[g] * C[α] ) * 1/255
blue     = ( L[b] * C[α] ) * 1/255
alpha    = ( L[a] * C[α] ) * 1/255
```



Plus

Renders the layered image arithmetically added to the current image. Channel values exceeding the allowed range are clipped to the maximum allowable level.

(pixel values are clipped)

```
red      = L[r] + C[r]
green    = L[g] + C[g]
blue     = L[b] + C[b]
alpha    = L[α] + C[α]
```



Minus

Renders the layered image arithmetically subtracted from the current image. Negative channel values are set to zero.

(pixel values are clipped)

```
red      = L[r] - C[r]
green    = L[g] - C[g]
blue     = L[b] - C[b]
alpha    = L[α] - C[α]
```



Difference

Renders the arithmetic difference (absolute value of the difference) between the current image and the layered image.

```
red      = absolute( L[r] - C[r] )
green    = absolute( L[g] - C[g] )
blue     = absolute( L[b] - C[b] )
alpha    = absolute( L[α] - C[α] )
```



Xor

Renders the layered image masked by the current image's alpha channel with the current image masked by the layered image's alpha channel.

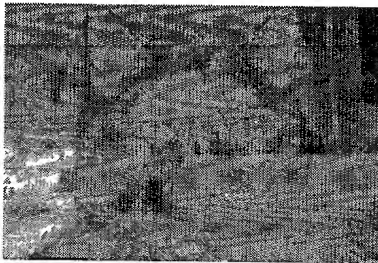
```
red      = ( L[r] * C[α] + C[r] * L[α] ) * 1/255
green    = ( L[g] * C[α] + C[g] * L[α] ) * 1/255
blue     = ( L[b] * C[α] + C[b] * L[α] ) * 1/255
alpha    = ( L[r] * C[α] + C[r] * L[α] ) * 1/255
```




ReplaceRed

Replaces the current image's red channel with the brightness of the layered image.

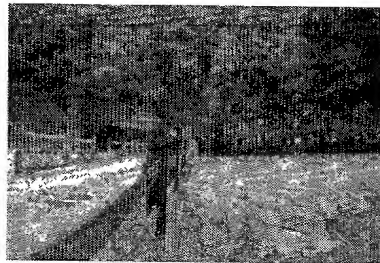
```
red      = brightness( L )
green    = C[g]
blue     = C[b]
```



ReplaceGreen

Replaces the current image's green channel with the brightness of the layered image.

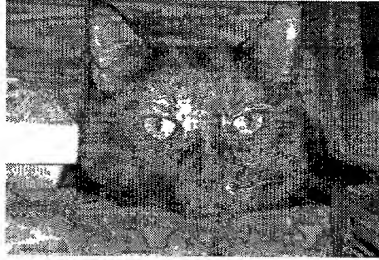
```
red      = C[r]
green    = brightness( L )
blue     = C[b]
```



ReplaceBlue

Replaces the current image's blue channel with the brightness of the layered image.

```
red      = C[r]
green    = C[g]
blue     = brightness( L )
```



ReplaceAlpha

Replaces the current image's alpha channel with the brightness of the layered image.

(no visible change)

```
red      = C[r]  
green    = C[g]  
blue     = C[b]  
alpha    = brightness( L )
```

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contrast

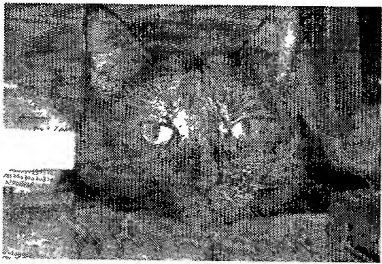
Description

Perform automatic image contrast optimization.

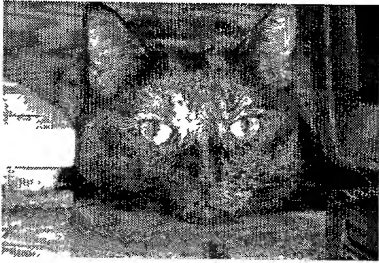
Arguments

Argument	Type	Description
increase	truelfalse	Default: True. If true, the contrast is increased. If false, the contrast is decreased.

Example



Original



contrast=increase[true]

crop

Description

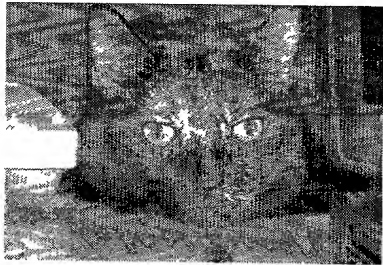
Crop an image

Arguments

Argument	Type	Description
width	number	Optional. Width, in pixels, of the image region to preserve. If omitted, the area from the horizontal offset x to the right edge of the image is preserved.
height	number	Optional. Height, in pixels, of the image region to preserve. If omitted, the area from the vertical offset y to the bottom edge of the image is preserved.
x	number	Default: 0 Horizontal offset, in pixels, from the left edge of the image where cropping will begin. Any image area to the right of this value is preserved.
y	number	Default: 0 Vertical offset, in pixels, from the top edge of the image where cropping will begin. Any image area below this value is preserved.

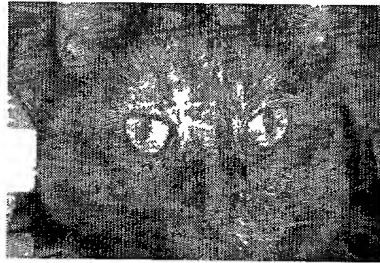
Example

The original image:



Cropping 60 pixels from all sides, results in:

```
source=url[http://www.liquidpixels.net/images/truff.jpg]&  
crop=x[60],y[60],width[(a.width-120)],  
      height[(a.height-120)]&  
sink
```



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double

Description

Double the size of an image via linear interpolation. Linear interpolation is high speed, mediocre quality. See scale on page 137 for higher-quality alternatives.

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draw**Description**

Draw arbitrary line-graphics onto an image.

Arguments

Argument	Type	Description
primitive	line	Required.
	rectangle	The name of the graphic element to draw.
	arc ellipse	
	circle	
	polyline	
	polygon	
	bezier	
points	color	Required.
	pointlist	
		A space separated list of points appropriate for the primitive selected. Multiple instances of the same primitive can be imaged by specifying multiple sets of coordinates.
	Line:	Sequence of x,y pairs
	Rectangle:	Left, Top, Right, Bottom
	Arc:	Start _x Start _y End _x End _y Bias _{start} Bias _{end}
	Ellipse:	Center x,y, x radius, y radius, start angle, end angle
	Circle:	Center _x Center _y Point _x Point _y
	Polyline:	Sequence of x,y points
	Polygon:	Sequence of x, y points. Polygons are closed polylines.
stroke	color	Bezier: 4 pairs of points, defining start, control ₁ , control ₂ , and end
		Stroke color
		Fill color
fill	color	Fill color
tile	string	Optional.
		Name of an image in the image pool to use as a pattern when drawing.
swidth	number	Optional.
		width, in pixels, of strokes

Argument	Type	Description
translate	pointlist	Optional. X, Y offset at which drawing begins.
scale	number	Optional. If present, coordinates in drawing operations are scaled by this factor.
rotate	number	Optional. If present, drawing operations are rotated counterclockwise.
skewx	number	Optional. If present, drawing operations are skewed in the horizontal direction
skewy	number	Optional. If present, drawing operations are skewed in the vertical direction

Example

A few lines:

```
blank=width[300],height[200]&
draw=primitive[line],points[20+50+280+50],stroke[black]&
draw=primitive[line],points[20+70+280+70],stroke[red]&
draw=primitive[line],points[20+90+280+90],
    stroke[purple],swidth[10]&
sink
```



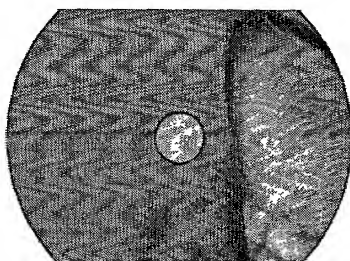
Arcs:

```
blank=width[300],height[200]&
draw=primitive[arc],points[150+100+50+70+50+50],
    stroke[black],swidth[2]&
draw=primitive[arc],points[150+100+200+90+20+20],
    stroke[darkgreen],swidth[2]&
draw=primitive[arc],points[150+100+200+40+40+20],
    stroke[purple],swidth[3]&
sink
```



Circles:

```
source=url[http://www.liquidpixels.net/images/truff.jpg],
    name[cat]&
blank=width[300],height[200]&
draw=primitive[circle],points[150+100+10+100],
    stroke[black],swidth[2],tile[cat]&
draw=primitive[circle],points[150+100+170+100],
    stroke[black],swidth[2],fill[gray80]&
sink=format[gif]
```



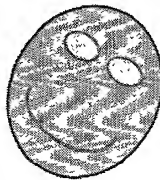
ellipses:

```
blank=width[300],height[200]&
draw=primitive[ellipse],points[150+100+60+70+0+360],
stroke[black],swidth[2],fill[gray80]&
draw=primitive[ellipse],points[150+100+60+70+290+360],
stroke[black],swidth[2]&
draw=primitive[ellipse],points[130+70+15+10+0+360],
stroke[darkgreen],swidth[2],fill[lavender]&
draw=primitive[ellipse],points[170+70+15+10+0+360],
stroke[darkgreen],swidth[2],fill[lavender]&
draw=primitive[ellipse],points[150+120+40+25+0+180],
stroke[purple],swidth[3]&
sink=format[gif]
```



Affine Transformations:

```
blank=width[300],height[200]&
draw=primitive[ellipse],points[150+100+60+70+0+360],
stroke[black],swidth[2],fill[gray80],rotate[30],
translate[50+-50]&
draw=primitive[ellipse],points[130+70+15+10+0+360],
stroke[darkgreen],swidth[2],fill[lavender],rotate[30],
translate[50+-50]&
draw=primitive[ellipse],points[170+70+15+10+0+360],
stroke[darkgreen],swidth[2],fill[lavender],rotate[30],
translate[50+-50]&
draw=primitive[ellipse],points[150+120+40+25+0+180],
stroke[purple],swidth[3],rotate[30],translate[50+-50]&
sink=format[gif]
```



fill

Description

Fill a region of an image to the nearest image border.

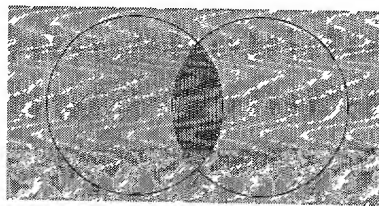
Arguments

Argument	Type	Description
x	number	Required. The horizontal location at which to begin pouring ink.
y	number	Required. The vertical location at which to begin pouring ink.
color	color	Required. The color to flood the image.

Example

While the `draw` command provides powerful drawing primitives including control over fill and stroke color, there are times when areas of an image must be painted by alternative means. Here, two interlocking circles form a shape which is filled with the `fill` command.

```
blank=width[300],height[150],color[skyblue]
draw=primitive[Cir-
cle],points[100+75+30+75],swidth[1],stroke[black]
draw=primitive[Cir-
cle],points[200+75+270+75],swidth[1],stroke[black]
fill=x[150],y[75],color[Red]
sink=format[gif]
```



filter

Description

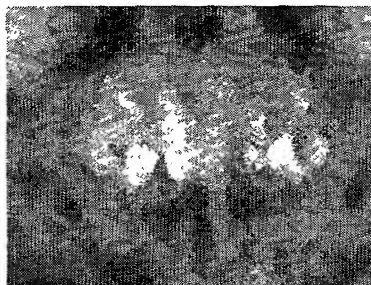
Process an image through an image filter or special effect.

Additional filters can be added to LiquiFire.

Arguments

Argument	Type	Description
effect	denoise	Required.
	despeckle	The name of the filter to be applied.
	emboss	
	enhance	
	equalize	
	implode	
	invert	
	noise	
	normalize	
	paint	
	shade	
	sketch	
	solarize	
	spread	
	swirl	
	wave	
level	number	Required.
		Determines the strength of the effect. This value has differing meanings for each filter. See Appendix, "Filter Control Values" on page 189 for specific filter semantics.
alpha	number	Optional for certain effects.
		This value has differing meanings for each filter. See Appendix, "Filter Control Values" on page 189 for specific filter semantics.
beta	number	Optional for certain effects.
		This value has differing meanings for each filter. See Appendix, "Filter Control Values" on page 189 for specific filter semantics.

Example



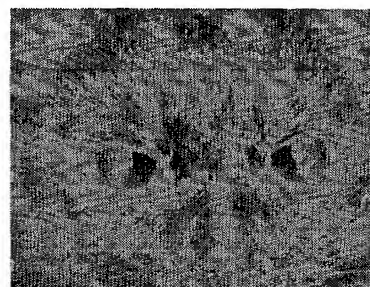
`filter=effect[Paint],level[3]`



`filter=effect[shade],
level[15],alpha[270]`



`filter=effect[sketch],level[10]`



`filter=effect[solarize],
level[50]`

flipx

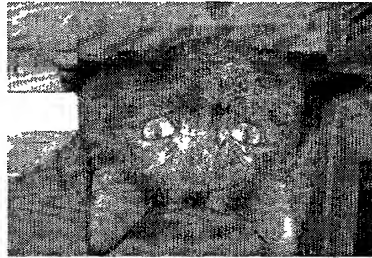
Description

Mirror an image along its X axis; vertically flip the image, top to bottom.

Arguments

none

Example



flipy

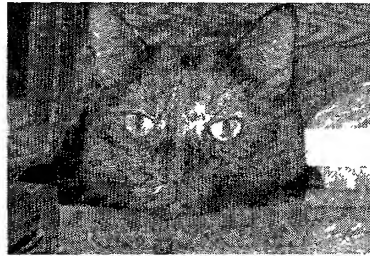
Description

Mirror an image along its Y axis; horizontally flip the image, left to right.

Arguments

none

Example



frame

Description

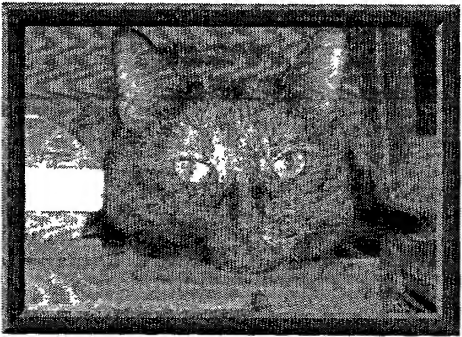
Create a beveled frame around an image, increasing the size of the image buy the size of the frame.

Arguments

Argument	Type	Description
width	number	Default: 15 Overall combined width, in pixels of each of the three bevel components
height	number	Default: 15 Overall combined height, in pixels of each of the three bevel components
inner	number	Default: 5 Number of pixels used for the lighter inner bevel
outer	number	Default: 5 Number of pixels used for the darker inner bevel
color	color	Default: gray70 Color of the frame

Example

```
source=url[http://www.liquidpixels.net/images/truff.jpg]&  
frame=width[20],height[20],color[blue]&  
sink
```



grid

Description

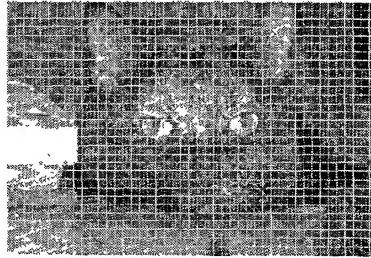
Draw a grid of lines on an image.
Grid spacing, color, thickness, and position can all be controlled.

Arguments

Argument	Type	Desctiption
step	number	Default: 10 If present, determines the spacing between the grid lines in both the vertical and horizontal direction.
xstep	number	Optional. If present, independantly determines the spacing between the vertical grid lines. Overrides step.
ystep	number	Optional. If present, independantly determines the spacing between the horizontal grid lines. Overrides step.
color	color	Default: Black If present, determines the color of the grid lines.
swidth	number	Default: 1 If present, determines the thickness of the gridlines.
x	number	Optional. If present, the grid will begin at the specified horizontal location on the image.
y	number	Optional. If present, the grid will begin at the specified vertical location on the image.
width	number	Optional. If present, the grid will end at the specified horizontal location on the image.
height	number	Optional. If present, the grid will end at the specified vertical location on the image.

Example

```
source=url[http://www.liquidpixels.net/TestImages/truff.jpg]
scale=size[50%]
grid=color[yellow]
sink
```



gamma

Description

Apply a gamma correction curve to the image, or to one (or more) channels.

Arguments

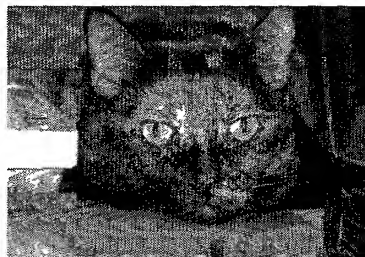
Argument	Type	Description
gamma	number	Optional, One argument required. If present, the entire image is adjusted by the application of gamma correction
red	number	Optional, One argument required. If present, the red channel is adjusted by the application of gamma correction
green	number	Optional, One argument required. If present, the green channel is adjusted by the application of gamma correction
blue	number	Optional, One argument required. If present, the blue channel is adjusted by the application of gamma correction

Example

```
source=url[http://www.liquidpixels.net/TestImages/truff.jpg]
scale=size[50%]
gamma=gamma[2.0]
sink
```



gamma=gamma[2.0]



gamma=gamma[0.6]

gblur

Description

Apply a Gaussian blurring to an image.

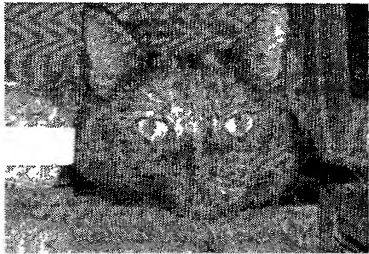
When blurring an image, numerous options exist for the mechanism and nature of the blurring function. One such mechanism, called a Gaussian blur, attempts to blur the digital image much the way an optical lens would - symmetrically in all directions from any single point. The function enables the user to specify the amount of blur (sigma) and the extent of the blur from any point (radius).

Arguments

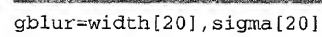
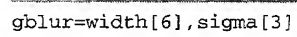
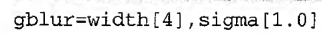
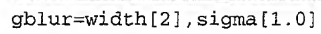
Argument	Type	Description
width	number	Required. The extent of the blurring from any point.
sigma	number	Default: 1.0 The amount of blurring to apply.

Example

```
source=url[http://www.liquidpixels.net/TestImages/truff.jpg]&  
scale=size[300x300]&  
gblur=width[2],sigma[1.0]&  
sink
```



Original



Halve the size of an image. Pixel halving is performed by linear interpolation - High speed, mediocre quality. See scale on page 137 for higher-quality alternatives.

none

hue

Description

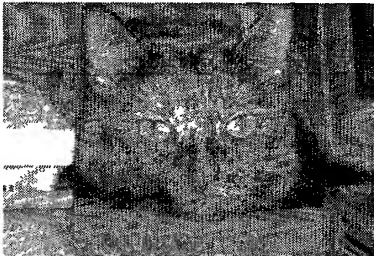
Adjusts hue (color) of an image

Arguments

Argument	Type	Description
value	number	Required. $0 \leq n \leq 100$ The amount of hue adjustment, as a percentage of 360°, to apply. A value of 50 shifts colors 180°, a value of 100 shifts colors 360°.

Example

```
source=url[http://www.liquidpixels.net/images/truff.jpg]&
scale=size[50%]&
hue=value[20]&
sink
```



layer

Description

Replace the current image or add a named image to the pool containing the channel specified from the current image. The layer command replaces the original image data with a monochrome image from the selected channel. See the duplicate command to preserve the original image in the pool.

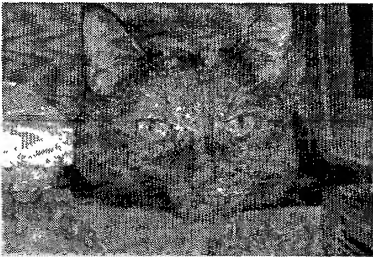
Arguments

Argument	Type	Description
layer	red green blue alpha	The name of the channel to select
name	string	Optional; If omitted, the color channel specified is extracted and replaces the current image in the pool. If specified, the extracted layer is added to the pool under this name.

Example

To darken the green channel in an image (which will appear as a magenta cast), the layer command and brightness commands are used:

```
source=url[http://www.liquidpixels.net/images/truff.jpg],
name[cat]&
layer=layer[green],name[greenchannel]&
brightness=value[80]&
select=name[cat]&
composite=compose[replaceGreen],image[greenchannel]&
sink
```



optimize

Description

Adds format-specific optimizations from an image.

Certain formats, such as GIF-89, are capable of presenting their image data as several frames, each with its own origin, color table, and size. The optimize command identifies redundancies in the image and processes each frame to the smallest size possible, with the most efficient color table.

Optimized images are difficult to manipulate, but are significantly smaller when transmitted.

Arguments

none

quantize

Description

Reduce the number of colors in an image by using stepwise quantization.

Quantization maintains an even distribution of the image's colors while grouping them into evenly spaced clusters, and replaces the colors in the image with the average color of the cluster.

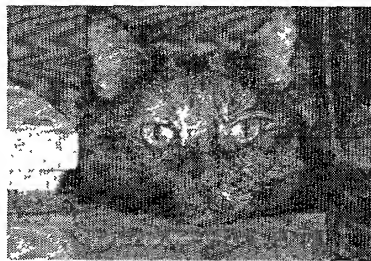
Optionally, the quantize command can be used to convert the image from one colorspace to another, by specifying the colorspace argument.

Arguments

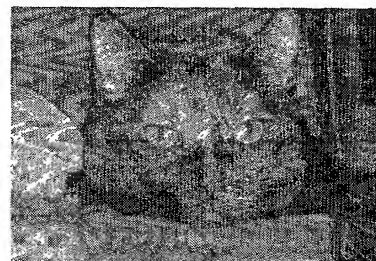
Argument	Type	Description
colors	number	Required. The maximum number of colors in the new image
dither	Boolean	Default: false If true, the image is dithered to appear as if more colors are in use.
colorspace	RGB Gray Transparent OHTA XYZ YCbCr YIQ YPbPr YUV	Optional. The name of an alternative colorspace.

Example

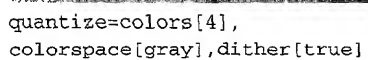
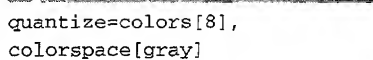
```
source=url[http://www.liquidpixels.net/images/truff.jpg],name[c]&
quantize=colors[16]&
sink
```



quantize=colors[16]



quantize=colors[8],dither[true]



Description

Arguments

See

“addprofile” on page 83.

resize

Description

Scale an image, using a specific sampling algorithm.
See “scale” on page 137.

Arguments

Argument	Type	Description
size	dim!%labsSize!	The desired size of the image. Size can be specified as a percentage (n%), an enclosing rectangle (mxn), or an absolute size in pixels (mxn!)
filter	Point!Box! Triangle! Hermite! Hanning! Hamming! Blackman! Gaussian! Quadratic! Cubic! Catrom! Mitchell! Lanczos! BesselSinc	Default: point The name of the sampling algorithm to use.

Relative Performance

Filter	Overhead	Filter	Overhead
Point	(baseline)	Quadratic	160%
Box	114%	Mitchell	160%
Hamming	128%	Cubic	162%
Triangle	128%	Lanczos	196%
Hermite	128%	Cantrom	197%
Blackman	129%	Bessel	206%
Hanning	132%	Sinc	231%
Gaussian	136%		

TABLE 1. Relative Filter Performance

roll

Description

Roll an image horizontally or vertically.

Rolling an image shifts the content, replacing the original content with the portion of the image that fall outside the original image bounds.

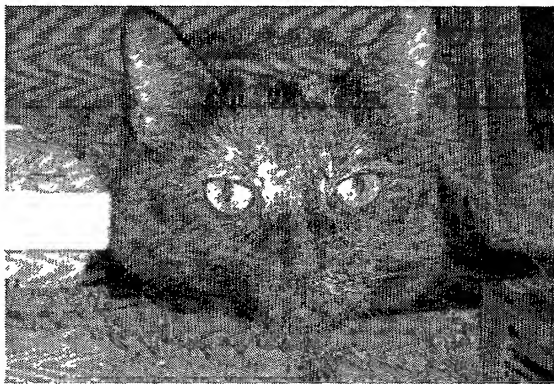
Arguments

Argument	Type	Description
x	number	Optional. The horizontal displacement, in pixels.
y	number	Optional. The vertical displacement, in pixels.

Example

By using the border command, in conjunction with the roll command and LiquiFire's ability to evaluate expressions, we can create a space for text annotations - regardless of the image's size.

```
source=url[http://www.liquidpixels.net/images/truff.jpg]
,name[cat]&
border=height[20],width[1]&
roll=y[(cat.height-19)]&
annotate=gravity[south],font[Arial-Roman],
text[A+Cat],pointsize[14],y[-28]&
sink
```



A Cat

rotate

Description

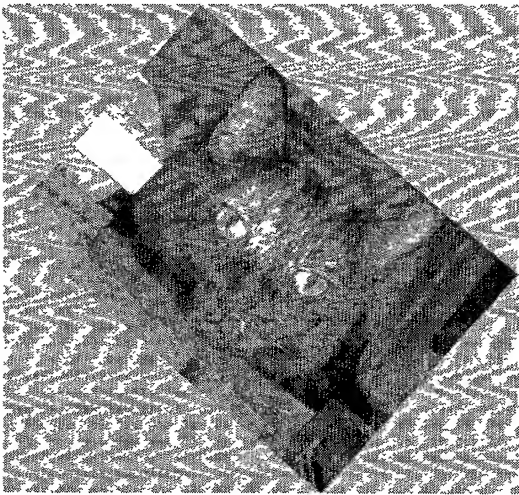
Rotate an image clockwise.

Arguments

Argument	Type	Description
degrees	number	Required. The angle, in degrees.
fill	color	Optional. If present, the 'triangles' remaining are filled with this color when an image is rotated an amount other than 90° increments.

Example

```
source=url[http://www.liquidpixels.net/images/truff.jpg]&  
scale=size[50%]&  
rotate=degrees[38.5],fill[lightblue]&  
sink
```





saturation

Description

Adjusts saturation of an image

Arguments

Argument	Type	Description
value	number	Required. The amount of saturation adjustment to apply, represented as percent. A value of 0 will desaturate an image completely – converting it to grayscale; 100 represents no change; values greater than 100 increase saturation.

Example



Original



saturation=value[50]



saturation=value[150]

scale

Description

Scale an image. Image dimensions can be specified in 4 ways:

Mechanism	Format	Description
a fixed target size	widthxheight!	In this mode, the image will be scaled to exactly the dimensions specified. The image will be distorted from the original aspect ratio if necessary.
an enclosing rectangle	widthxheight	In this mode, the image will be scaled to the maximum size possible within the specified dimensions, preserving the image's aspect ratio
an enclosing square	side	Shorthand; equivalent to an enclosing rectangle with equal sides
a percentage	percent%	The image will be decreased in size if the number is less than 100; increased for numbers greater than 100.

TABLE 2. Image Dimension Specification

Arguments

Argument	Type	Description
size	dim!%! absSize!	The desired size of the image. Size can be specified as a percentage (nn%), an enclosing rectangle (mmxnn), or an absolute size in pixels (mmxnn!)
width	number	Optional. If present, the image is scaled to the specified width, in pixels.
height	number	Optional. If present, the image is scaled to the specified width, in pixels.

Example

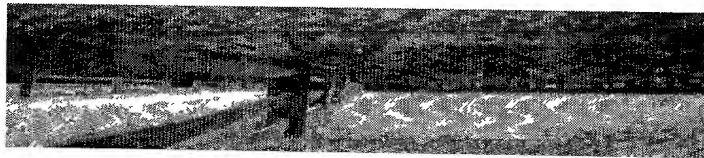
Here, we specify the scale size in 'enclosing square' mode. The resulting image's aspect ratio is preserved with the larger size scaled to 400 pixels and the other such that the image is not stretched.

```
source=url[http://www.liquidpixels.net/images/Fence.tif]&  
scale=size[400]&  
sink
```



Fixed target size can be used to stretch images:

```
source=url[http://www.liquidpixels.net/images/Fence.tif]  
scale=size[500x100!]  
sink
```



segment

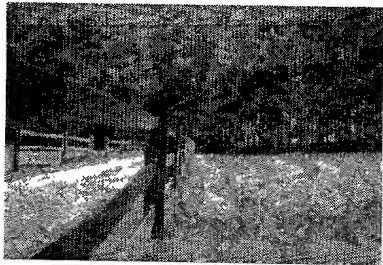
Description

Perform color reduction by histogram analysis and similar-color clustering. Very accurate, Very computationally expensive (slow)

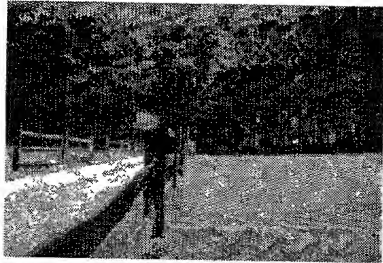
Arguments

Argument	Type	Description
colorspace	RGB Gray Transparent OHTA XYZ YCbCr YIQ YPbPr YUV	Optional. If present, specifies new colorspace for the image. Note that, for non-direct conversion, profile-based color management is not employed during this conversion
cluster	number	Weight to apply to color clusters
smooth	number	Amount of smoothing applied to the histogram. Higher numbers result in fewer colors

Example



Original



segment=smooth[0.2]



segment=smooth[0.5]

sharpen

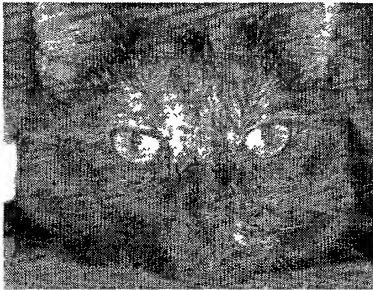
Description

Apply sharpening with a laplacian kernel to an image.
See also usharpmask on page 147.

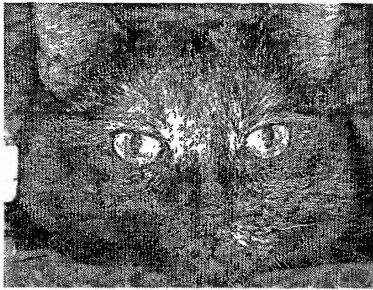
Arguments

Argument	Type	Description
radius	number	Required. The extent of the sharpening from any point.
sigma	number	Default: 1.0 The amount of sharpening to apply.

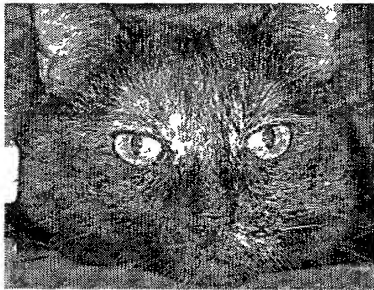
Example



Original



sharpen=radius[1], sigma[20]



sharpen=radius[2], sigma[20]

showid

Description

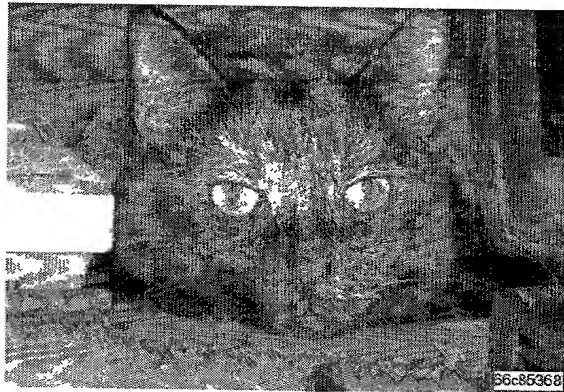
Images the JobID onto the image. This is useful when developing complex image chains as the JobID can be used in LiquiFire Orb to obtain additional detailed information about the processing of a job.

Arguments

None

Example

```
source=url[http://www.liquidpixels.net/images/truff.jpg]
scale=size[50%]
showid
sink
```



svg

Description

Manipulate Scalable Vector Graphics documents dynamically.

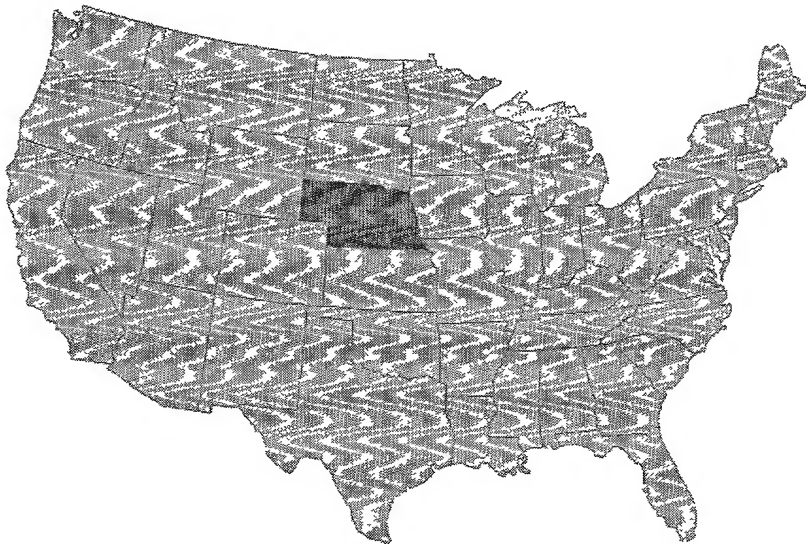
Additional information about SVG can be found at
<http://www.w3.org/TR/2001/PR-SVG-20010719/index.html>

Arguments

Argument	Type	Description
id	number	Required. The id for the SVG element you which to alter.
type	style	Required The type of manipulation to perform. Currently only styles may be changed.
value	string	Required The new value for the attribute

Example

```
source=url[http://www.liquidpixels.net/images/USA.svg]
svg=type[style],id[NE],value[fill:teal;]
sink
```



threshold

Description

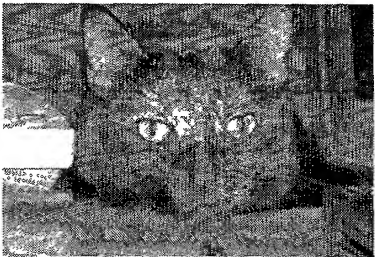
Convert an image to monochrome via intensity thresholding.

The image is first converted to greyscale (more accurately, the intensity of each pixel is evaluated). The gray levels are then mapped to either 'black' or 'white' by the threshold value. Gray levels below the threshold are changed to 'white' while those at or above the threshold are changed to 'black.'

Arguments

Argument	Type	Description
level	number	Default: 128 ($0 \leq n \leq 255$) The gray level at which pixels are mapped to black.

Example



Original



threshold=level[64]



threshold=level[192]

tile

Description

Fill the current image by tiling the specified image.

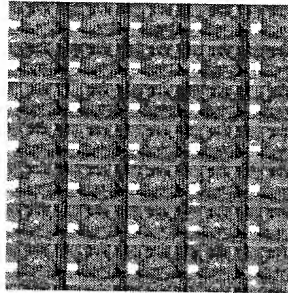
Arguments

Argument	Type	Description
image	string	The name of the image in the image pool to be used as the tile.

Example

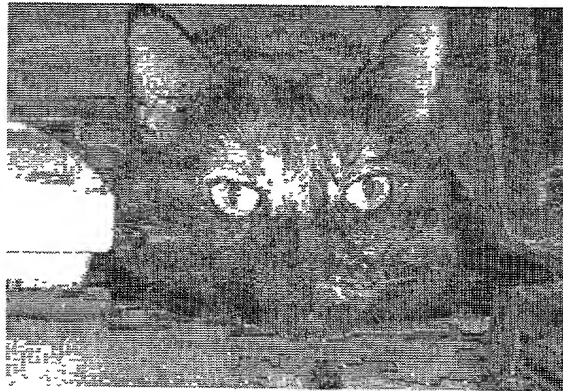
The first example takes the cat image, scales it to fit within a 64 pixel square, and uses this small picture as a tile on a blank image background.

```
source=url[http://www.liquidpixels.net/images/truff.jpg],
      name[cat]&
scale=size[64]&
blank=width[300],height[300]&
tile=image[cat]&
sink
```



Here, we use LiquiFire to create the now ubiquitous 'Apple Effect' where an image is modified to contain lighter lines throughout:

```
source=url[http://www.liquidpixels.net/images/truff.jpg],
name[cat]&
scale=size[50%]&
blank=width[4],height[4],name[tile]&
draw=primitive[line],points[0 0 3 0],stroke[black]&
draw=primitive[line],points[0 2 3 2],stroke[black]&
blank=width[(cat.width)],height[(cat.height)],name[lines]&
tile=image[tile]&
brightness=value[30]&
select=name[cat]&
composite=compose[difference],image[lines]&
sink
```



transparent

Description

Indicate that the color specified should be transparent in formats which support transparency.

Arguments

Argument	Type	Description
color	color	Required. The color to be marked transparent.

Example

```
text=font[GillSans-Bold],pointsize[24],fill[Navy],
    text[Hello+Again]&
transparent=color[white]&
sink=format[gif]
```

Hello Again

usharpmask

Description

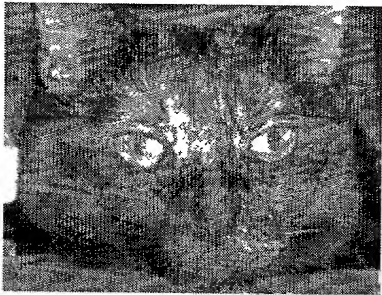
Applies an unsharp masking transformation to an image.

Unsharp masking works by accentuating the difference between details, actually brightening and darkening adjacent pixels to increase apparent sharpness.

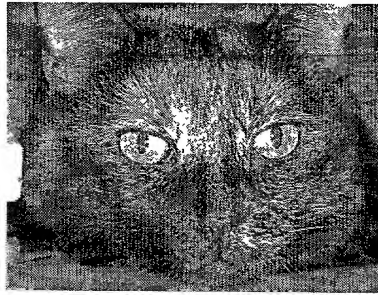
Arguments

Argument	Type	Description
radius	number	Required. The range of pixels adjacent to be affected.
amount	number	Required. The amount of adjustment to apply, as a percentage. Typical values range between 50 and 150 (%).
threshold	number	Optional. If present, the threshold which must be exceeded before sharpening is applied; if omitted, all pixels are affected.
sigma	number	Default: 5 The standard deviation of the gaussian kernel, in pixels.

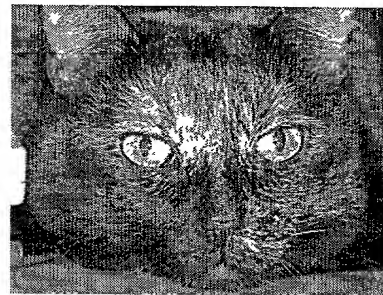
Example



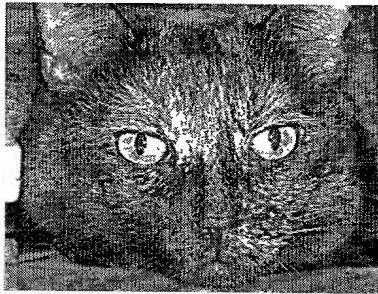
Original



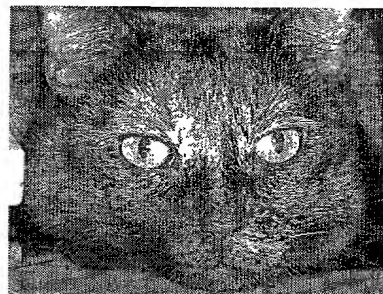
```
usharpmask=radius[1],  
amount[150]
```



```
usharpmask=radius[1.5],  
amount[120]
```



```
usharpmask=radius[3],  
amount[120]
```



```
usharpmask=radius[1],  
amount[120],sigma[10]
```

Description

Removes format-specific optimizations from an image.

Certain formats, such as GIF-89, are capable of presenting their image data as several frames, each with its own origin, color table, and size. The `unoptimize` command converts each frame into an image the full size of the background image, and creates a unified color table. Images that have been unoptimized are larger, but may be much more easily manipulated in a uniform fashion.

Use the optimize command to reverse the process.

none

watermark

Description

Hides an image in the low-order bits of the current image

Arguments

Argument	Type	Description
image	string	Required. The name of an image in the image pool to be hidden in the image
offset	number	Optional. The numeric offset to be applied to the data as it is embedded.

Macros

addalpha

Description

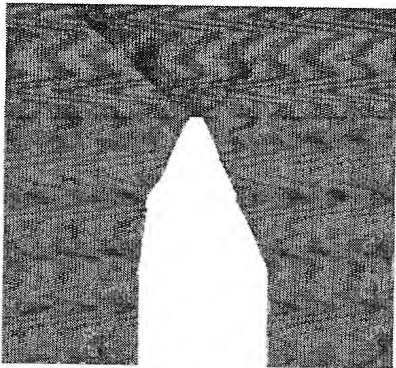
Creates an image with transparency (alpha channel) from the combination of a color image and a mask image. The brightness of the mask image are used to define the opacity.

Arguments

Argument	Type	Description
image	url	Required; The url for the color image
mask	url	Required; The url for the mask image
invert	boolean	Default: false If true, the mask image is inverted before the combination process is performed.
name	string	Optional; If present, determines the the name for the combined image in the pool.

Example

```
addalpha=image[http://www.liquidpixels.net/images/Gray.jpg],
mask[http://www.liquidpixels.net/images/GrayMask.jpg],
name[shirt],invert[true]&
blank=width[shirt.width],height[shirt.height]&
composite=compose[over],image[shirt]&
sink
```



bullet

Description

Creates an image containing a dingbat, or symbol, and a single line of text, similar to a bulleted item.

Arguments

Argument	Type	Description
size	integer	Default: 10 When the glyph argument is present, determines the size of the glyph drawn, in pixels.
space	integer	Optional; If present, determines the space, in pixels, surrounding the glyph drawn. If omitted, the space is set to one-half the size of the glyph.
bgcolor	color	Default: white If present, determines the the background color for the image.
glyph	circlesquare	Optional; If present, determines the shape of the glyph to image adjacent to the text.
glyphfill	color	Default: black If present, determines the color of the glyph
glyphstroke	color	Optional; If present, the glyph is stroked (outlined) in the color specified.
glyphswidth	integer	Default: 1 If present, determines the thickness of the glyph stroke.
image	name	Optional; If present, the image named will be used in place of a graphic glyph.
pointsize	See "annotate" on page 85.	
font	See "annotate" on page 85.	

Argument	Type	Description
text		See "annotate" on page 85.
fill		See "annotate" on page 85.
swidth		See "annotate" on page 85.
stroke		See "annotate" on page 85.

Example

```
bullet=text[Item+Number+Six],pointsize[16],
    glyphfill[darkred],font[Arial-Roman],fill[navy],glyph[square]
sink
```

■ Item Number Six

```
source=url[file:DingbatC.eps],name[pixels]
scale=size[20]
bullet=text[LiquidPixels],pointsize[14],
    font[Arial-Roman],image[pixels]
sink
```

* LiquidPixels

mftext

Description

Render text onto multiple frames of a multi-frame image.

This macro adds a sequence of select – annotate pairs operators to the image chain.

Arguments

Argument	Type	Description
start	number	Required. Frame number at which to start imaging text
end	number	Required. Frame number at which to end imaging text
name	string	Required. Name of multi-frame image in image pool on which text is to be rendered.
x	number	Required. Horizontal position of text baseline
y	number	Required. Vertical position of text baseline
xstep	number	Optional. If present, the horizontal position of the text baseline will be incremented by this value for each subsequent frame, resulting in animated text.
ystep	number	Optional. If present, the vertical position of the text baselinewill be incremented by this value for each subsequent frame resulting in animated text.
gravity	See “annotate” on page 85.	
font	See “annotate” on page 85.	
pointsize	See “annotate” on page 85.	
fill	See “annotate” on page 85.	
stroke	See “annotate” on page 85.	
swidth	See “annotate” on page 85.	
text	string	Required. The text to be rendered onto the selected frames

Example

The banner image contains 39 frames of animation, and is stored as an optimized gif. Here, we use mftext three times to image a number onto multiple frames, so it persists for a portion of the animation. The optimize command removes this redundancy when the image is transmitted as GIF.

```
source=url[http://www.someserver.com/images/banner.gif]&
unoptimize&
mftext=start[1],end[10],name[_],font[GillSans-Roman],
    gravity[Southwest],x[50],y[-10],text[AAPL:+21.125],
    pointsize[12],fill[white]&
mftext=start[11],end[20],name[_],font[GillSans-Roman],
    gravity[Southwest],x[170],y[-10],text[IBM:+114.05],
    pointsize[12],fill[white]&
mftext=start[21],end[30],name[_],font[GillSans-Roman],
    gravity[Southwest],x[290],y[-10],text[SUNW:+31.125],
    pointsize[12],fill[white]&
select=name[_]&
optimize&
sink=format[GIF],loop[forever]
```



This example depicts the creation of a four-frame image with the word 'Wheree' imaged at four locations on each frame.

```
blank=width[100],height[50],name[b]&
blank=width[100],height[50],name[a]&
attribute=key[delay],value[20]&
addframe=image[b],delay[20]&
addframe=image[b],delay[20]&
addframe=image[b],delay[20]&
select=image[a]&
mftext=font[Arial-Roman],pointsize[18],text[Wheree],
    start[1],end[4],xstep[10],x[5],y[30],name[a]&
select=image[a]&
sink=format[gif],loop[forever]
```

Wheree	Wheree	Wheree	Wheree
Frame 1	Frame 2	Frame 3	Frame 4

text

Description

Image text onto a new, appropriately sized, background image.

Text may contain unicode characters, expressed as `Unnnn`, where `nnnn` is a valid Unicode character value, or as extended characters, expressed as `\nnn`, where `nnn` is a valid ascii-extended character code.

Multiple lines may be imaged together; line breaks may be expressed by `\n` within the text.

Additional typefaces can be added to LiquiFire via FTP or LiquiFire Orb, or via URL.

Arguments

Argument	Type	Description
text	string	Required. The text to be rendered
font	See "annotate" on page 85.	
pointsize	See "annotate" on page 85.	
name	string	Optional. If specified, the new image created by the text macro will be added to the image pool under this name. Otherwise, the image will be created as the current image.
pad	number	Optional. If specified, the background image will be larger than the bounding-box of the text by the specified number of pixels.
padx	number	Optional. If specified, the background image will be larger in width than the bounding-box of the text by the specified number of pixels. Overrides pad.
pady	number	Optional. If specified, the background image will be larger in height than the bounding-box of the text by the specified number of pixels. Overrides pad.
bgcolor	string	Default: white The color of the background image
fill	See "annotate" on page 85.	

```
text=text[LiquidPixels\054+Incorporated],
      font[Anyway-Bold],pointsize[24]&
sink
```

LiquiaPixels, Incorporated

textcurve

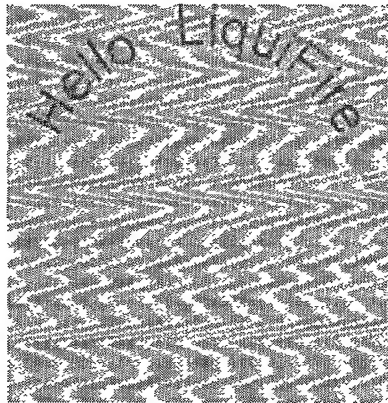
Description

Render text along the radius of a curve.

Arguments

Argument	Type	Description
text	string	Required. The text to be rendered onto the current image
font	See "annotate" on page 85.	
fill	See "annotate" on page 85.	
pointsize	See "annotate" on page 85.	
stroke	See "annotate" on page 85.	
swidth	See "annotate" on page 85.	
radius	number	Required. The radius, in pixels, of the circle on which the text will be imaged
x	number	Required. The horizontal location of the center of the circle
y	number	Required. The vertical location of the center of the circle
start	number	Optional. If present, the text will start from the angle specified and continue clockwise. If omitted, the text is centered along the top edge of the circle
spacing	number	Optional. If present, letters will be drawn at the specified separation. If omitted, letters are drawn following the font-specified character spacing


```
blank=width[200],height[200],color[gray80]&
textcurve=text[Hello+LiquiFire],x[100],y[100],radius[80],
    font[Arial-Roman],pointsize[20],fill[green]&
sink
```



Description

To access the activity log, the Job ID is required. The showid command can be used to facilitate access to this execution information via LiquiFire Orb. See “showid” on page 141.

none

Metacommands

auth

Description

Convey authorization information for a request.

Arguments

Argument	Type	Description
hash	string	Optional; hash or cipher must be present. If present, indicates the provided key is a unique hash specific to the request and unique server 'secret.'
cipher	string	Optional; hash or cipher must be present. If present, indicates the provided key is a unique cryptographic cipher specific to the request and unique server 'secret.'

Example

```
source=url[http://www.liquidpixels.net/images/cat.jpg]&  
scale=geometry[200x200]&  
auth=hash[d409fb30]&  
sink
```

countdown

Description

Calculates the time remaining from the current time until the date specified.

Arguments

Argument	Type	Description
key	string	Required. The name of the metadata field to set
target	string	Required. The target date, in practically any format, including: Dow, dd Mon yyyy, dd Mon yy, dd Mon yyyy, Mon dd yyyy, yyyy/mm/dd, yyyy/mm, mm/dd/yy, mm/dd/yyyy, mm/yy, count "days", count "weeks", count "months", count "years", Dow "after next", "next" Dow, "tomorrow", "today", "yesterday", "last" dow, "last week"
name	string	Optional. If specified, the name of the image where the resulting metadata will be set. If omitted, the Global metadata will be set.
type	Days Seconds	Default: days Seconds: returns the countdown in seconds remaining until the target date. Days: returns the countdown in days remaining to the target date.

Example

```
countdown=key[day],target[11/22/2001]&
text=text[There+are+(global.day)+days+till+Thanksgiving],
font[Arial-Roman],pointsize[16]&
sink
```


fontmetrics

Description

Determines the future resulting size of text when rendered in a specified font and size.

The resulting dimensions are added as esoteric metadata to the current image under the names metrics.x and metrics.y.

Arguments

Argument	Type	Description
text	string	Required. The text to be measured
font	string	Required. The name of the typeface in which to render the text
pointsize	number	Required. The size, in points, in which to render the text

Example

```
fontmetrics=text[Hello],pointsize[30],font[Arial-Bold]&
blank=width[(_.metrics.x%2B5)],height[(_.metrics.y%2B5)]&
annotate=text[Hello],pointsize[30],gravity[Center],
      font[Arial-Bold]&
sink
```

Hello

load

Description

Retrieve an image chain, or image chain fragment stored in a file from a web server, ftp server, or file within a LiquiFire server.

Arguments

Argument	Type	Description
url	url	Required. Describes the source for the image data

Example

With a file named /chains/tab.chain containing

```
source=url[file:tab.eps]&
annotate=font[Arial-Roman],pointsize[9],text[global.section],
gravity[Center],fill[black]
```

located on a server <http://www.liquidpixels.net>, the request:

```
set=key[section],value[Section+One]&
load=url[http://www.liquidpixels.net/chains/tab.chain]&
sink=format[gif]
```

creates the effective request

```
set=key[section],value[Section+One]&
source=url[file:tab.eps]&
annotate=font[Arial-Roman],pointsize[9],text[global.section],
gravity[Center],fill[black]&
sink=format[gif]
```



regexcase

Description

A case statement for string expression matching.

Given a list of strings, returns the corresponding value when the key matches one of the specified expressions.

Arguments

Argument	Type	Description
key	string	Required. The key to match against the cases.
name	string	Required. The name of the global metadata field to contain the result
cases	string	Required. A ' ' separated list of extended regular expression patterns. Cases are searched in order.
values	string	Required A ' ' separated list of results to return when the specified key matches the corresponding expression specified in cases
default	string	Optional. The result to return should the key does not match any of the specified expressions

Example

In this example, the `countdown` command is used to calculate the number of days remaining until November 22, 2001. This value, stored in the global metadata field `day` is then matched against two regular expressions with the `regexcase` command. The first expression, `^.\d`, will match a single character, while the second expression, `^\d{2,}`, will match one or more characters. If the number of days is 9 or less – a single digit – the first expression will match and `regexcase` will set the global metadata field `vday` to `'a few'`. Otherwise, `global.vday` is set to the value in the `global.day` field originally set by `countdown`.


```
countdown=key[day],target[11/22/2001]&  
regexcase=name[vday],key[global.day],cases[^\.$|.%.2b],  
  values[a+few|global.day]&  
text=text[There+are+global.vday+days+till+Thanksgiving],  
  font[Arial-Roman],pointsize[16]&  
sink=format[gif]
```

There are a few days till Thanksgiving

There are 294 days till Thanksgiving

set

Description

Sets a field in the global metadata to the value specified

Arguments

Argument	Type	Description
key	string	Required. The name of the field to set
value	string	Optional. If specified, the value of the field will be set to the value specified. If omitted, the value of the metadata field will be cleared.

168

time

Description

Populate esoteric metadata fields with values corresponding to the date and time specified, or the current time, if no date is specified.

The time command populates 33 subfields of the `global.date` metadata field.

Arguments

Argument	Type	Description
date	string	Optional. If omitted, the current time and date The time and/or date for which the fields should be populated. Times can be expressed in practically any format, including: Dow, dd Mon yyyy, dd Mon yy, dd Mon yyyy, Mon dd yyyy, yyyy/mm/dd, yyyy/mm, mm/dd/yy, mm/dd/yyyy, mm/yy, count "days", count "weeks", count "months", count "years", Dow "after next", "next" Dow, "tomorrow", "today", "yesterday", "last" dow, "last week"

Fields

Format	Description	Example
date.zhour	Hour number, 24 hour format, with leading zero	00
date.zhr	Hour number, 12 hour format, with leading zero	00
date.hour	Hour number, 24 hour format	0
date.hr	Hour number, 12 hour format	0
date.zmin	Minute number, with leading zeros	45
date.min	Minute number	45
date.zsec	Second number, with leading zeros	56
date.sec	Second number	56
date.zday	Day number, with leading zero	01
date.day	Day number	1
date.zmnum	Month number, with leading zeros	01
date.mnum	Month number	1
date.mon	Abbreviated month name	Jan
date.month	Month name	January

Format	Description	Example
date.yr	Year, 2 digit format	03
date.year	Year, 4 digit format	2003
date.zdoy	Day of the year, starting from 1, with leading zeros	001
date.doy	Day of the year, starting from 1	1
date.wkdy	Abbreviated day of the week	Mon
date.weekday	Day of the week	Monday
date.wkdynum	Week number, weeks start on Sunday	4
date.monornate	Ornate month (st, nd, rd)	2nd
date.ampm	Meridian indication	AM
date.quarter	Year quarter number	1
date.zone	Timezone, abbreviated universal form	EST
date.zonenum	Timezone, numeric form	-0500
date.mdyhms	Terse month/day/year hour:minute:second	01/01/01 00:00:00
date.long	Standard Internet format, including timezone	Mon Jan 1 00:00:00 EST 2001
date.mdy	Terse month/day/year	01/01/01
date.hms	hour:minute:second	03:45:56
date.hm	hour:minute	03:45
date.hmsampm	hour:minute:second with meridian	03:45:56 AM
date.common	Common long form date	Thursday, January 2, 2003
date.commontz	Common long form date, with timezone	Thursday, January 2, 2003 EST

Example

```
time=date[1/2/2003+3:05:56]&
text=font[Arial-Roman],pointsize[14],text[global.date.common]&
sink
```

Thursday, January 2, 2003

timecase

Description

A case statement for dates.

Given a list of dates, times, or date-times, returns the corresponding value when the current time falls within one of the specified ranges.

Arguments

Argument	Type	Description
name	string	Required. The name of the global metadata field to contain the result
cases	string	Required. A ' ' separated list of time ranges. Ranges are specified as two times, separated by a dash ('-'). Times can be expressed in practically any format, including: Dow, dd Mon yyyy, dd Mon yy, dd Mon yyyy, Mon dd yyyy, yyyy/mm/dd, yyyy/mm, mm/dd/yy, mm/dd/yyyy, mm/yy, count "days", count "weeks", count "months", count "years", Dow "after next", "next" Dow, "tomorrow", "today", "yesterday", "last" dow, "last week"
values	string	Required. A ' ' separated list of results to return when the current date falls within the corresponding date range specified in cases
default	string	Optional. The result to return when the current date does not fall within any of the specified ranges

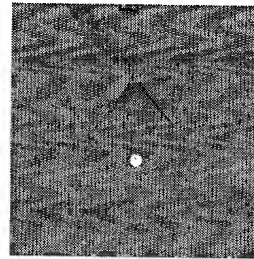
Example

Assuming a clothing sale runs for the seven days prior to Halloween, the following chain would display a sale indicator atop the image only during the sale period:

```
timecase=name[ss],cases[10/24/2001-10/31/2001],
  values[1],default[0]&
source=url[file:o/SpikeySplat.svg],name[splat]&
transparent=color[white]&
annotate=text[Sale!],font[GillSans-BoldItalic],
  pointsize[fit],width[(splat.width-60)],
  height[(splat.height-60)],
  gravity[Center],fill[red],stroke[black],swidth[2],
  if[global.ss]&
source=url[http://www.liquidpixels.net/images/shirttie/
  Blue-s.jpg],name[shirt]&
scale=size[200]&
blank=width[300],height[shirt.height]&
composite=image[shirt]&
composite=image[splat],gravity[northeast],if[global.ss]&
sink=format[jpg]
```



current date is between
10/24/2001 and 10/31/2001



current date outside the range























































When color is to be specified, it may be described by name or by component value. To describe by value, colors are specified in the following format:























































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




















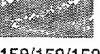



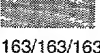

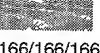



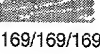

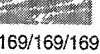



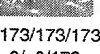

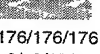



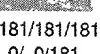

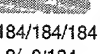



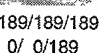

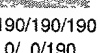


where RR represents a hexadecimal value for the Red component, GG represents a hexadecimal value for the Green component, and BB represents a hexadecimal value for the Blue component. Note that within requests presented over HTTP, the '#' symbol must be escaped as '%23.'








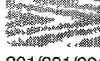














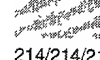


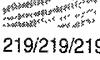





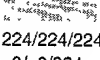


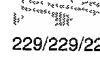


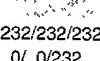


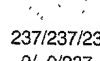


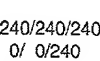


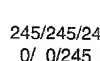


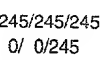


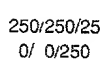

The list of supported color names, along with their definitions are identified in the tables that follow.

LiquiFire User's Guide: Color Definitions





























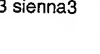


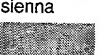


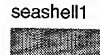


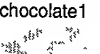








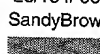


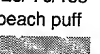


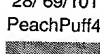

					
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5/ 5/ 5 0/ 0/ 5 gray2	8/ 8/ 8 0/ 0/ 8 gray3	8/ 8/ 8 0/ 0/ 8 gray3	10/ 10/ 10 0/ 0/ 10 gray4	10/ 10/ 10 0/ 0/ 10 gray4	13/ 13/ 13 0/ 0/ 13 gray5
					
13/ 13/ 13 0/ 0/ 13 gray5	15/ 15/ 15 0/ 0/ 15 gray6	15/ 15/ 15 0/ 0/ 15 gray6	18/ 18/ 18 0/ 0/ 18 gray7	18/ 18/ 18 0/ 0/ 18 gray7	20/ 20/ 20 0/ 0/ 20 gray8
					
20/ 20/ 20 0/ 0/ 20 gray8	23/ 23/ 23 0/ 0/ 23 gray9	23/ 23/ 23 0/ 0/ 23 gray9	26/ 26/ 26 0/ 0/ 26 gray10	26/ 26/ 26 0/ 0/ 26 gray10	28/ 28/ 28 0/ 0/ 28 gray11
					
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




















































					
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74/ 74/ 74 0/ 0/ 74 grey29	77/ 77/ 77 0/ 0/ 77 gray30	77/ 77/ 77 0/ 0/ 77 grey30	79/ 79/ 79 0/ 0/ 79 gray31	79/ 79/ 79 0/ 0/ 79 grey31	82/ 82/ 82 0/ 0/ 82 gray32
					
82/ 82/ 82 0/ 0/ 82 grey32	84/ 84/ 84 0/ 0/ 84 gray33	84/ 84/ 84 0/ 0/ 84 grey33	87/ 87/ 87 0/ 0/ 87 gray34	87/ 87/ 87 0/ 0/ 87 grey34	89/ 89/ 89 0/ 0/ 89 gray35
					
89/ 89/ 89 0/ 0/ 89 grey35	92/ 92/ 92 0/ 0/ 92 gray36	92/ 92/ 92 0/ 0/ 92 grey36	94/ 94/ 94 0/ 0/ 94 gray37	94/ 94/ 94 0/ 0/ 94 grey37	97/ 97/ 97 0/ 0/ 97 gray38
					
97/ 97/ 97 0/ 0/ 97 grey38	99/ 99/ 99 0/ 0/ 99 gray39	99/ 99/ 99 0/ 0/ 99 grey39	102/ 102/ 102 0/ 0/ 102 gray40	102/ 102/ 102 0/ 0/ 102 grey40	105/ 105/ 105 0/ 0/ 105 dim gray
					
105/ 105/ 105 0/ 0/ 105 DimGray	105/ 105/ 105 0/ 0/ 105 dim grey	105/ 105/ 105 0/ 0/ 105 DimGrey	105/ 105/ 105 0/ 0/ 105 gray41	105/ 105/ 105 0/ 0/ 105 grey41	107/ 107/ 107 0/ 0/ 107 gray42
					
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122/ 122/ 122 0/ 0/ 122 grey48	125/ 125/ 125 0/ 0/ 125 gray49	125/ 125/ 125 0/ 0/ 125 grey49	127/ 127/ 127 0/ 0/ 127 gray50	127/ 127/ 127 0/ 0/ 127 grey50	130/ 130/ 130 0/ 0/ 130 gray51























































					
130/130/130 0/ 0/130 grey51	133/133/133 0/ 0/133 gray52	133/133/133 0/ 0/133 grey52	135/135/135 0/ 0/135 gray53	135/135/135 0/ 0/135 grey53	138/138/138 0/ 0/138 gray54
					
138/138/138 0/ 0/138 grey54	140/140/140 0/ 0/140 gray55	140/140/140 0/ 0/140 grey55	143/143/143 0/ 0/143 gray56	143/143/143 0/ 0/143 grey56	145/145/145 0/ 0/145 gray57
					
145/145/145 0/ 0/145 grey57	148/148/148 0/ 0/148 gray58	148/148/148 0/ 0/148 grey58	150/150/150 0/ 0/150 gray59	150/150/150 0/ 0/150 grey59	153/153/153 0/ 0/153 gray60
					
153/153/153 0/ 0/153 grey60	156/156/156 0/ 0/156 gray61	156/156/156 0/ 0/156 grey61	158/158/158 0/ 0/158 gray62	158/158/158 0/ 0/158 grey62	161/161/161 0/ 0/161 gray63
					
161/161/161 0/ 0/161 grey63	163/163/163 0/ 0/163 gray64	163/163/163 0/ 0/163 grey64	166/166/166 0/ 0/166 gray65	166/166/166 0/ 0/166 grey65	168/168/168 0/ 0/168 gray66
					
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179/179/179 0/ 0/179 grey70	181/181/181 0/ 0/181 gray71	181/181/181 0/ 0/181 grey71	184/184/184 0/ 0/184 gray72	184/184/184 0/ 0/184 grey72	186/186/186 0/ 0/186 gray73
					
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











































					
191/191/191 0/ 0/191 grey75	194/194/194 0/ 0/194 gray76	194/194/194 0/ 0/194 grey76	196/196/196 0/ 0/196 gray77	196/196/196 0/ 0/196 grey77	199/199/199 0/ 0/199 gray78
					
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224/224/224 0/ 0/224 gray88	224/224/224 0/ 0/224 grey88	227/227/227 0/ 0/227 gray89	227/227/227 0/ 0/227 grey89	229/229/229 0/ 0/229 gray90	229/229/229 0/ 0/229 grey90
					
232/232/232 0/ 0/232 gray91	232/232/232 0/ 0/232 grey91	235/235/235 0/ 0/235 gray92	235/235/235 0/ 0/235 grey92	237/237/237 0/ 0/237 gray93	237/237/237 0/ 0/237 grey93
					
240/240/240 0/ 0/240 gray94	240/240/240 0/ 0/240 grey94	242/242/242 0/ 0/242 gray95	242/242/242 0/ 0/242 grey95	245/245/245 0/ 0/245 white smoke	245/245/245 0/ 0/245 WhiteSmoke
					
245/245/245 0/ 0/245 gray96	245/245/245 0/ 0/245 grey96	247/247/247 0/ 0/247 gray97	247/247/247 0/ 0/247 grey97	250/250/250 0/ 0/250 gray98	250/250/250 0/ 0/250 grey98























































252/252/252 0/ 0/252 gray99	252/252/252 0/ 0/252 grey99	255/255/255 0/ 0/255 white	255/255/255 0/ 0/255 gray100	255/255/255 0/ 0/255 grey100	139/137/137 0/ 3/137 snow4
205/201/201 0/ 4/201 snow3	255/250/250 0/ 5/250 snow	255/250/250 0/ 5/250 snow1	238/233/233 0/ 5/233 snow2	188/143/143 0/ 61/143 rosy brown	188/143/143 0/ 61/143 RosyBrown
255/193/193 0/ 62/193 RosyBrown1	238/180/180 0/ 62/180 RosyBrown2	205/155/155 0/ 62/155 RosyBrown3	139/105/105 0/ 62/105 RosyBrown4	240/128/128 0/119/128 light coral	240/128/128 0/119/128 LightCoral
205/ 92/ 92 0/140/ 92 indian red	205/ 92/ 92 0/140/ 92 IndianRed	139/ 58/ 58 0/148/ 58 IndianRed4	238/ 99/ 99 0/148/ 99 IndianRed2	255/106/106 0/149/106 IndianRed1	205/ 85/ 85 0/149/ 85 IndianRed3
165/ 42/ 42 0/190/ 42 brown	139/ 35/ 35 0/190/ 35 brown4	255/ 64/ 64 0/191/ 64 brown1	205/ 51/ 51 0/191/ 51 brown3	238/ 59/ 59 0/191/ 59 brown2	178/ 34/ 34 0/206/ 34 firebrick
255/ 48/ 48 0/207/ 48 firebrick1	139/ 26/ 26 0/207/ 26 firebrick4	205/ 38/ 38 0/207/ 38 firebrick3	238/ 44/ 44 0/207/ 44 firebrick2	255/ 0/ 0 0/255/ 0 red	255/ 0/ 0 0/255/ 0 red1
238/ 0/ 0 0/255/ 0 red2	205/ 0/ 0 0/255/ 0 red3	139/ 0/ 0 0/255/ 0 red4	139/ 0/ 0 0/255/ 0 dark red	139/ 0/ 0 0/255/ 0 DarkRed	205/183/181 5/ 29/181 MistyRose3
255/228/225 6/ 30/225 misty rose	255/228/225 6/ 30/225 MistyRose	255/228/225 6/ 30/225 MistyRose1	250/128/114 6/138/114 salmon	238/213/210 6/ 30/210 MistyRose2	139/125/123 8/ 29/123 MistyRose4
205/ 79/ 57 9/184/ 57 tomato3	238/ 92/ 66 9/184/ 66 tomato2	255/ 99/ 71 9/184/ 71 tomato	255/ 99/ 71 9/184/ 71 tomato1	139/ 54/ 38 10/185/ 38 tomato4	205/ 91/ 69 10/169/ 69 coral3























































					
139/ 62/ 47 10/168/ 47 coral4	238/106/ 80 10/169/ 80 coral2	255/114/ 86 10/169/ 86 coral1	238/130/ 98 14/150/ 98 salmon2	205/112/ 84 14/150/ 84 salmon3	139/ 76/ 57 14/150/ 57 salmon4
					
255/140/105 14/150/105 salmon1	233/150/122 15/121/122 dark salmon	233/150/122 15/121/122 DarkSalmon	139/ 37/ 0 16/255/ 0 OrangeRed4	205/ 55/ 0 16/255/ 0 OrangeRed3	255/127/ 80 16/175/ 80 coral
					
238/ 64/ 0 16/255/ 0 OrangeRed2	255/ 69/ 0 16/255/ 0 orange red	255/ 69/ 0 16/255/ 0 OrangeRed	255/ 69/ 0 16/255/ 0 OrangeRed1	238/149/114 17/132/114 LightSalmon2	255/160/122 17/133/122 light salmon
					
255/160/122 17/133/122 LightSalmon	255/160/122 17/133/122 LightSalmon1	139/ 87/ 66 17/133/ 66 LightSalmon4	205/129/ 98 17/133/ 98 LightSalmon3	205/104/ 57 19/184/ 57 sienna3	238/121/ 66 19/184/ 66 sienna2
					
255/130/ 71 19/184/ 71 sienna1	160/ 82/ 45 19/183/ 45 sienna	139/ 71/ 38 20/185/ 38 sienna4	255/245/238 25/ 17/238 seashell	255/245/238 25/ 17/238 seashell1	238/118/ 33 25/219/ 33 chocolate2
					
205/102/ 29 25/218/ 29 chocolate3	255/127/ 36 25/219/ 36 chocolate1	210/105/ 30 25/218/ 30 chocolate	139/ 69/ 19 25/220/ 19 saddle brown	139/ 69/ 19 25/220/ 19 SaddleBrown	139/ 69/ 19 25/220/ 19 chocolate4
					
205/197/191 26/ 17/191 seashell3	238/229/222 26/ 17/222 seashell2	139/134/130 27/ 16/130 seashell4	244/164/ 96 28/154/ 96 sandy brown	244/164/ 96 28/154/ 96 SandyBrown	238/203/173 28/ 69/173 PeachPuff2
					
205/175/149 28/ 69/149 PeachPuff3	255/218/185 28/ 70/185 peach puff	255/218/185 28/ 70/185 PeachPuff	255/218/185 28/ 70/185 PeachPuff1	139/119/101 28/ 69/101 PeachPuff4	255/165/ 79 29/176/ 79 tan1
					
139/ 90/ 43 29/176/ 43 tan4	238/154/ 73 29/176/ 73 tan2	205/133/ 63 30/176/ 63 peru	205/133/ 63 30/176/ 63 tan3	238/118/ 0 30/255/ 0 DarkOrange2	139/ 69/ 0 30/255/ 0 DarkOrange4























































					
205/102/ 0 30/255/ 0 DarkOrange3	255/127/ 0 30/255/ 0 DarkOrange1	250/240/230 30/ 20/230 linen	205/183/158 32/ 58/158 bisque3	255/228/196 33/ 59/196 bisque	255/228/196 33/ 59/196 bisque1
					
238/213/183 33/ 58/183 bisque2	255/140/ 0 33/255/ 0 dark orange	255/140/ 0 33/255/ 0 DarkOrange	205/192/176 33/ 36/176 AntiqueWhite3	255/239/219 33/ 36/219 AntiqueWhite1	139/115/ 85 33/ 99/ 85 burlywood4
					
238/223/204 34/ 36/204 AntiqueWhite2	238/197/145 34/ 99/145 burlywood2	255/211/155 34/100/155 burlywood1	139/125/107 34/ 58/107 bisque4	205/170/125 34/ 99/125 burlywood3	222/184/135 34/ 99/135 burlywood
					
250/235/215 34/ 35/215 antique white	250/235/215 34/ 35/215 AntiqueWhite	210/180/140 34/ 85/140 tan	139/131/120 35/ 34/120 AntiqueWhite4	238/207/161 36/ 82/161 NavajoWhite2	255/222/173 36/ 82/173 navajo white
					
255/222/173 36/ 82/173 NavajoWhite	255/222/173 36/ 82/173 NavajoWhite1	255/235/205 36/ 50/205 blanched almond	255/235/205 36/ 50/205 blanchedAlmond	139/121/ 94 36/ 82/ 94 NavajoWhite4	205/179/139 36/ 82/139 NavajoWhite3
					
255/239/213 37/ 42/213 papaya whip	255/239/213 37/ 42/213 PapayaWhip	255/228/181 38/ 74/181 moccasin	255/165/ 0 39/255/ 0 orange	255/165/ 0 39/255/ 0 orange1	238/154/ 0 39/255/ 0 orange2
					
139/ 90/ 0 39/255/ 0 orange4	139/126/102 39/ 67/102 wheat4	205/133/ 0 39/255/ 0 orange3	245/222/179 39/ 68/179 wheat	253/245/230 39/ 23/230 old lace	253/245/230 39/ 23/230 OldLace
					
255/231/186 39/ 69/186 wheat1	205/186/150 39/ 68/150 wheat3	238/216/174 39/ 68/174 wheat2	255/250/240 40/ 15/240 floral white	255/250/240 40/ 15/240 FloralWhite	255/185/ 15 43/240/ 15 DarkGoldenrod1
					
238/173/ 14 43/240/ 14 DarkGoldenrod1	205/149/ 12 43/240/ 12 DarkGoldenrod2	139/101/ 8 43/240/ 8 DarkGoldenrod3	184/134/ 11 43/239/ 11 Dark goldenrod	184/134/ 11 43/239/ 11 DarkGoldenrod4	139/105/ 20 43/218/ 20 goldenrod4

					
218/165/ 32 43/217/ 32 goldenrod	255/193/ 37 43/218/ 37 goldenrod1	238/180/ 34 43/218/ 34 goldenrod2	205/155/ 29 43/218/ 29 goldenrod3	255/248/220 48/ 35/220 cornsilk	255/248/220 48/ 35/220 cornsilk1
					
238/232/205 49/ 35/205 cornsilk2	205/200/177 49/ 34/177 cornsilk3	238/220/130 50/115/130 LightGoldenrod1	255/236/139 50/116/139 LightGoldenrod2	205/190/112 50/115/112 LightGoldenrod3	139/129/ 76 50/115/ 76 LightGoldenrod4
					
139/117/ 0 51/255/ 0 gold4	139/136/120 51/ 34/120 cornsilk4	238/221/130 51/115/130 light goldenrod	238/221/130 51/115/130 LightGoldenrod3	255/215/ 0 51/255/ 0 gold	255/215/ 0 51/255/ 0 gold1
					
205/173/ 0 51/255/ 0 gold3	238/201/ 0 51/255/ 0 gold2	238/233/191 54/ 50/191 LemonChiffon1	205/201/165 54/ 49/165 LemonChiffon2	255/250/205 54/ 50/205 LemonChiffon3	255/250/205 54/ 50/205 LemonChiffon4
					
255/250/205 54/ 50/205 LemonChiffon1	240/230/140 54/106/140 khaki	238/232/170 55/ 72/170 pale goldenrod	238/232/170 55/ 72/170 PaleGoldenrod	139/134/ 78 55/111/ 78 khaki4	255/246/143 55/112/143 khaki1
					
205/198/115 55/111/115 khaki3	238/230/133 55/112/133 khaki2	139/137/112 56/ 49/112 LemonChiffon4	189/183/107 56/110/107 dark khaki	189/183/107 56/110/107 DarkKhaki	139/139/131 60/ 14/131 ivory4
					
205/205/193 60/ 14/193 ivory3	238/238/224 60/ 15/224 ivory2	255/255/240 60/ 15/240 ivory	255/255/240 60/ 15/240 ivory1	245/245/220 60/ 26/220 beige	255/255/224 60/ 31/224 light yellow
					
255/255/224 60/ 31/224 LightYellow	255/255/224 60/ 31/224 LightYellow1	238/238/209 60/ 31/209 LightYellow2	205/205/180 60/ 31/180 LightYellow3	139/139/122 60/ 31/122 LightYellow4	250/250/210 60/ 40/210 light goldenrod yellow
					
250/250/210 60/ 40/210 LightGoldenrodYellow	255/255/ 0 60/255/ 0 yellow	255/255/ 0 60/255/ 0 yellow1	238/238/ 0 60/255/ 0 yellow2	205/205/ 0 60/255/ 0 yellow3	139/139/ 0 60/255/ 0 yellow4

					
105/139/ 34 79/192/ 34 OliveDrab4	192/255/ 62 80/193/ 62 OliveDrab1	107/142/ 35 80/192/ 35 olive drab	107/142/ 35 80/192/ 35 OliveDrab	179/238/ 58 80/192/ 58 OliveDrab2	154/205/ 50 80/192/ 50 yellow green
					
154/205/ 50 80/192/ 50 YellowGreen	154/205/ 50 80/192/ 50 OliveDrab3	85/107/ 47 82/142/ 47 dark olive green	85/107/ 47 82/142/ 47 DarkOliveGreen	202/255/112 82/143/112 DarkOliveGreen	110/139/ 61 82/143/ 61 DarkOliveGreen4
					
188/238/104 82/143/104 DarkOliveGreen	162/205/ 90 82/143/ 90 DarkOliveGreen	173/255/ 47 84/208/ 47 green yellow	173/255/ 47 84/208/ 47 GreenYellow	127/255/ 0 90/255/ 0 chartreuse	127/255/ 0 90/255/ 0 chartreuse1
					
102/205/ 0 90/255/ 0 chartreuse3	69/139/ 0 90/255/ 0 chartreuse4	118/238/ 0 90/255/ 0 chartreuse2	124/252/ 0 90/255/ 0 lawn green	124/252/ 0 90/255/ 0 LawnGreen	131/139/131 120/ 14/131 honeydew4
					
193/205/193 120/ 14/193 honeydew3	224/238/224 120/ 15/224 honeydew2	240/255/240 120/ 15/240 honeydew	240/255/240 120/ 15/240 honeydew1	143/188/143 120/ 61/143 dark sea green	143/188/143 120/ 61/143 DarkSeaGreen
					
193/255/193 120/ 62/193 DarkSeaGreen	180/238/180 120/ 62/180 DarkSeaGreen	155/205/155 120/ 62/155 DarkSeaGreen	105/139/105 120/ 62/105 DarkSeaGreen	152/251/152 120/100/152 pale green	152/251/152 120/100/152 PaleGreen
					
144/238/144 120/100/144 PaleGreen2	144/238/144 120/100/144 light green	144/238/144 120/100/144 LightGreen	124/205/124 120/100/124 PaleGreen3	84/139/ 84 120/100/ 84 PaleGreen4	154/255/154 120/101/154 PaleGreen1
					
34/139/ 34 120/192/ 34 forest green	34/139/ 34 120/192/ 34 ForestGreen	50/205/ 50 120/192/ 50 lime green	50/205/ 50 120/192/ 50 LimeGreen	0/100/ 0 120/255/ 0 dark green	0/100/ 0 120/255/ 0 DarkGreen
					
0/255/ 0 120/255/ 0 green	0/255/ 0 120/255/ 0 green1	0/238/ 0 120/255/ 0 green2	0/205/ 0 120/255/ 0 green3	0/139/ 0 120/255/ 0 green4	78/238/148 146/171/148 SeaGreen2

					
84/255/159 146/171/159 SeaGreen1	46/139/ 87 146/170/ 87 sea green	46/139/ 87 146/170/ 87 SeaGreen	46/139/ 87 146/170/ 87 SeaGreen4	67/205/128 147/171/128 SeaGreen3	60/179/113 147/169/113 medium sea green
					
60/179/113 147/169/113 MediumSeaGreen	0/238/118 150/255/118 SpringGreen2	0/139/ 69 150/255/ 69 SpringGreen4	0/205/102 150/255/102 SpringGreen3	0/255/127 150/255/127 spring green	0/255/127 150/255/127 SpringGreen
					
0/255/127 150/255/127 SpringGreen1	245/255/250 150/ 10/250 mint cream	245/255/250 150/ 10/250 MintCream	0/250/154 157/255/154 medium spring green	0/250/154 157/255/154 MediumSpringGreen	102/205/170 160/128/170 aquamarine
					
102/205/170 160/128/170 MediumAquaMarine	102/205/170 160/128/170 aquamarine3	127/255/212 160/128/212 aquamarine	127/255/212 160/128/212 aquamarine1	118/238/198 160/128/198 aquamarine2	69/139/116 160/128/116 aquamarine4
					
64/224/208 174/182/208 turquoise	32/178/170 177/209/170 light sea green	32/178/170 177/209/170 LightSeaGreen	72/209/204 178/167/204 medium turquoise	72/209/204 178/167/204 MediumTurquoise	131/139/139 180/ 14/139 turquoise4
					
193/205/205 180/ 14/205 azure3	224/238/238 180/ 15/238 azure2	240/255/255 180/ 15/255 azure	240/255/255 180/ 15/255 azure1	224/255/255 180/ 31/255 light cyan	224/255/255 180/ 31/255 LightCyan
					
224/255/255 180/ 31/255 LightCyan1	209/238/238 180/ 31/238 LightCyan2	180/205/205 180/ 31/205 LightCyan3	122/139/139 180/ 31/139 LightCyan4	175/238/238 180/ 67/238 pale turquoise	175/238/238 180/ 67/238 PaleTurquoise
					
102/139/139 180/ 67/139 PaleTurquoise4	187/255/255 180/ 68/255 PaleTurquoise3	150/205/205 180/ 68/205 PaleTurquoise2	174/238/238 180/ 68/238 PaleTurquoise1	47/ 79/ 79 180/103/ 79 dark slate gray	47/ 79/ 79 180/103/ 79 DarkSlateGray
					
47/ 79/ 79 180/103/ 79 dark slate gray	47/ 79/ 79 180/103/ 79 DarkSlateGray3	141/238/238 180/103/238 DarkSlateGray2	151/255/255 180/104/255 DarkSlateGray1	121/205/205 180/104/205 DarkSlateGray	82/139/139 180/104/139 DarkSlateGray4

					
0/139/139 180/255/139 cyan4	0/139/139 180/255/139 dark cyan	0/139/139 180/255/139 DarkCyan	0/205/205 180/255/205 cyan3	0/238/238 180/255/238 cyan2	0/255/255 180/255/255 cyan
					
0/255/255 180/255/255 cyan1	0/206/209 181/255/209 dark turquoise	0/206/209 181/255/209 DarkTurquoise	95/158/160 182/103/160 cadet blue	95/158/160 182/103/160 CadetBlue	0/134/139 182/255/139 turquoise4
					
0/229/238 182/255/238 turquoise2	0/197/205 182/255/205 turquoise3	0/245/255 182/255/255 turquoise1	83/134/139 185/102/139 CadetBlue4	142/229/238 186/102/238 CadetBlue2	122/197/205 186/103/205 CadetBlue3
					
152/245/255 186/103/255 CadetBlue1	176/224/230 187/ 59/230 powder blue	176/224/230 187/ 59/230 PowderBlue	104/131/139 194/ 64/139 LightBlue4	173/216/230 195/ 63/230 light blue	173/216/230 195/ 63/230 LightBlue
					
0/154/205 195/255/205 DeepSkyBlue1	191/239/255 195/ 64/255 LightBlue1	178/223/238 195/ 64/238 LightBlue2	0/191/255 195/255/255 deep sky blue	0/191/255 195/255/255 DeepSkyBlue	0/191/255 195/255/255 DeepSkyBlue1
					
0/104/139 195/255/139 DeepSkyBlue4	0/178/238 195/255/238 DeepSkyBlue2	154/192/205 195/ 63/205 LightBlue3	135/206/235 197/108/235 sky blue	135/206/235 197/108/235 SkyBlue	141/182/205 202/ 79/205 LightSkyBlue3
					
164/211/238 202/ 79/238 LightSkyBlue2	176/226/255 202/ 79/255 LightSkyBlue1	96/123/139 202/ 78/139 LightSkyBlue4	135/206/250 203/117/250 light sky blue	135/206/250 203/117/250 LightSkyBlue	108/166/205 204/120/205 SkyBlue3
					
135/206/255 205/120/255 SkyBlue1	126/192/238 205/120/238 SkyBlue2	74/112/139 205/119/139 SkyBlue4	92/172/238 207/156/238 SteelBlue2	79/148/205 207/156/205 SteelBlue3	70/130/180 207/155/180 steel blue
					
70/130/180 207/155/180 SteelBlue	99/184/255 207/156/255 SteelBlue1	54/100/139 208/155/139 SteelBlue4	240/248/255 208/ 15/255 alice blue	240/248/255 208/ 15/255 AliceBlue	24/116/205 210/225/205 DodgerBlue3

					
30/144/255 210/225/255 dodger blue	30/144/255 210/225/255 DodgerBlue	30/144/255 210/225/255 DodgerBlue1	28/134/238 210/225/238 DodgerBlue2	16/ 78/139 210/225/139 DodgerBlue4	112/128/144 210/ 56/144 slate gray
					
112/128/144 210/ 56/144 SlateGray	112/128/144 210/ 56/144 slate grey	112/128/144 210/ 56/144 SlateGrey	119/136/153 210/ 56/153 light slate gray	119/136/153 210/ 56/153 LightSlateGray	119/136/153 210/ 56/153 light slate grey
					
119/136/153 210/ 56/153 LightSlateGrey	159/182/205 210/ 57/205 SlateGray3	198/226/255 211/ 57/255 SlateGray1	185/211/238 211/ 56/238 SlateGray2	108/123/139 211/ 56/139 SlateGray4	110/123/139 213/ 53/139 LightSteelBlue4
					
162/181/205 213/ 53/205 LightSteelBlue	188/210/238 214/ 53/238 LightSteelBlue	176/196/222 214/ 52/222 Light steel blue	176/196/222 214/ 52/222 LightSteelBlue	202/225/255 214/ 53/255 LightSteelBlue	100/149/237 219/147/237 cornflower blue
					
100/149/237 219/147/237 CornflowerBlue	58/ 95/205 225/182/205 RoyalBlue3	67/110/238 225/183/238 RoyalBlue2	72/118/255 225/183/255 RoyalBlue1	65/105/225 225/181/225 royal blue	65/105/225 225/181/225 RoyalBlue
					
39/ 64/139 225/183/139 RoyalBlue4	248/248/255 240/ 7/255 ghost white	248/248/255 240/ 7/255 GhostWhite	230/230/250 240/ 20/250 lavender	25/ 25/112 240/198/112 midnight blue	25/ 25/112 240/198/112 MidnightBlue
					
0/ 0/128 240/255/128 navy	0/ 0/128 240/255/128 navy blue	0/ 0/128 240/255/128 NavyBlue	0/ 0/139 240/255/139 blue4	0/ 0/139 240/255/139 dark blue	0/ 0/139 240/255/139 DarkBlue
					
0/ 0/205 240/255/205 medium blue	0/ 0/205 240/255/205 MediumBlue	0/ 0/205 240/255/205 blue3	0/ 0/238 240/255/238 blue2	0/ 0/255 240/255/255 blue	0/ 0/255 240/255/255 blue1
					
105/ 89/205 248/144/205 SlateBlue3	131/111/255 248/144/255 SlateBlue1	106/ 90/205 248/143/205 slate blue	106/ 90/205 248/143/205 SlateBlue	71/ 60/139 248/144/139 SlateBlue4	132/112/255 248/143/255 light slate blue

LiquiFire User's Guide: Color Definitions

132/112/255	122/103/238	72/ 61/139	72/ 61/139	123/104/238	123/104/238
248/143/255	248/144/238	248/143/139	248/143/139	249/143/238	249/143/238
LightSlateBlue	SlateBlue2	dark slate blue	DarkSlateBlue	medium slate blue	MediumSlateBlue
93/ 71/139	159/121/238	137/104/205	147/112/219	147/112/219	171/130/255
259/124/139	259/125/238	260/125/205	260/124/219	260/124/219	260/125/255
MediumPurple	MediumPurple	MediumPurple	medium purple	MediumPurple	MediumPurple1
155/ 48/255	138/ 43/226	138/ 43/226	145/ 44/238	125/ 38/205	85/ 26/139
271/207/255	271/206/226	271/206/226	271/207/238	271/207/205	271/207/139
purple1	blue violet	BlueViolet	purple2	purple3	purple4
160/ 32/240	104/ 34/139	178/ 58/238	191/ 62/255	153/ 50/204	153/ 50/204
277/221/240	280/192/139	280/192/238	280/193/255	280/192/204	280/192/204
purple	DarkOrchid4	DarkOrchid2	DarkOrchid1	dark orchid	DarkOrchid
154/ 50/205	148/ 0/211	148/ 0/211	180/ 82/205	209/ 95/238	224/102/255
280/192/205	282/255/211	282/255/211	288/153/205	288/153/238	288/153/255
DarkOrchid3	dark violet	DarkViolet	MediumOrchid	MediumOrchid	MediumOrchid1
122/ 55/139	186/ 85/211	186/ 85/211	139/123/139	216/191/216	205/181/205
288/154/139	288/152/211	288/152/211	300/ 29/139	300/ 29/216	300/ 29/205
MediumOrchid	medium orchid	MediumOrchid	thistle4	thistle	thistle3
238/210/238	255/225/255	139/102/139	255/187/255	205/150/205	238/174/238
300/ 30/238	300/ 30/255	300/ 67/139	300/ 68/255	300/ 68/205	300/ 68/238
thistle2	thistle1	plum4	plum1	plum3	plum2
221/160/221	238/130/238	139/ 0/139	139/ 0/139	139/ 0/139	205/ 0/205
300/ 70/221	300/115/238	300/255/139	300/255/139	300/255/139	300/255/205
plum	violet	magenta4	dark magenta	DarkMagenta	magenta3
238/ 0/238	255/ 0/255	255/ 0/255	139/ 71/137	218/112/214	205/105/201
300/255/238	300/255/255	300/255/255	302/124/137	302/123/214	302/124/201
magenta2	magenta	magenta1	orchid4	orchid	orchid3

LiquiFire Syntax

```

lfescottet    = "\" DIGIT DIGIT DIGIT
lfunicode     = "U" DIGIT DIGIT DIGIT DIGIT
lfescape      = lfescottet | lfunicode | escape
lfname        = *( ALPHA | DIGIT )
lfsafe        = ALPHA | DIGIT | safe | lfescape

lfrequest     = *( lfcommand )
lfcommand     = lfname ["=" lfargs ]

lfargs        = *( lfargkey "[" lfargvalue "]" "," )
lfargkey      = *( ALPHA | DIGIT )
lfexpression  = "(" *( lfsafe | "!" | "*" | "'" ) ")"
lfargvalue    = lfsafe | lfexpression

```

Basic URI Syntax.

For definitive information on URL syntax and semantics, see RFC 1738 and RFC 1808

```

URI           = ( absoluteURI | relativeURI ) [ "#" fragment ]

absoluteURI   = scheme ":" *( uchar | reserved )
relativeURI   = net_path | abs_path | rel_path

net_path      = "/" net_loc [ abs_path ]
abs_path      = "/" rel_path
rel_path      = [ path ] [ ";" params ] [ "?" query ]

path          = fsegment *( "/" segment )
fsegment      = 1*pchar
segment       = *pchar

params        = param *( ";" param )
param         = *( pchar | "/" )
scheme        = 1*( ALPHA | DIGIT | "+" | "-" | "." )
net_loc       = *( pchar | ";" | "?" )

```

```

query      = *( uchar | reserved )
fragment   = *( uchar | reserved )

pchar      = uchar | ":" | "@" | "&" | "=" | "+"
uchar      = unreserved | escape
unreserved = ALPHA | DIGIT | safe | extra | national

escape     = "%" HEX HEX
reserved   = ";" | "/" | "?" | ":" | "@" | "&" | "=" | "+"
extra      = "!" | "*" | "'" | "(" | ")" | ","
safe       = "$" | "-" | "_" | "."
unsafe     = CTL | SP | "<" | ">" | "#" | "%" | "<" | ">"
national   = "{" | "}" | "|" | "\" | "^" | "~" | "[" | "]" | "`"

lowalpha   = "a" .. "z"
hialpha    = "A" .. "Z"
ALPHA       = lowalpha | hialpha
DIGIT       = "0" .. "9"

```

APPENDIX C***Filter Control Values***

Filter Type	Level	Alpha	Beta
Sketch	Degree of effect		
Emboss	Degree of effect		
Denoise	Degree of effect		
Implode	Degree of effect		
Solarize	Degree of effect		
Paint	Size of brush		
Swirl	Angle of swirling		
Shade	Elevation of light	Angle of light	
Wave	Amplitude	Wavelength	
Noise			
Despeckle			
Enhance			
Equalize			
Invert			
Normalize			
Spread			

LiquiFire

The following metadata fields are available for all images:

LiquiFire Name	Field Description
colors	Number of colors in the image
colorspace	Colorspace of the image; one of: RGB, Gray, Transparent, XYZ, YCbCr, YCC, YIQ, YPbPr, YUV, CMYK, sRGB
comment	Textual comment for the image
compress	Compression type; one of: None, BZip, Fax, Group4, JPEG, LosslessJPEG, LZW, Runlength, Zip
delay	Inter-frame delay
density	pixel density
depth	bits per pixel
dispose	GIF disposal mode
gamma	Image gamma compensation value, if assigned
height	Height of the image, in pixels
interlace	Image pixel organization; one of: Undefined, None, Linc, Plane, Partition
loop	GIF/MNG looping repetitions
matte	True if the image contains an alpha channel
monochrome	True if the image is bi-level
quality	For compression technologies, indicates the 'quality' or 'lossiness' of the compression
rendering_intent	Color management profile rendering intent; one of: Saturation, Perceptual, Absolute, Relative
subimage	Number of frames in the image
type	Image data type; one of: Bilevel, Grayscale, Palette, PaletteMatte, TrueColor, TrueColorMatte, ColorSeparation

LiquiFire Name	Field Description
units	Measurement units for density and resolution; one of: pixels/inch, pixels/mm
width	Width of the image, in pixels
x-resolution	Horizontal pixel density
y-resolution	Horizontal pixel density

IPTC Metadata

This standard, developed by a consortium of world-wide providers including Reuters and the Associated Press was designed to identify images, digital-audio, and digital-video, as well as to identify the transport over which these media travel. Divided into two parts covering the transport and content, respectively, IPTC metadata has become the de-facto standard for image metadata due to the support of widely available imaging packages such as Adobe™ PhotoShop™.

LiquiFire supports and maintains any elements within Part 2 that are present in the original image.

IPTC Name	IPTC ID	LiquiFire Name	Field Description
action advised	2:42	actionadvised	Action code, defined by image provider 2 digits
by-line	2:80	byline	Photographer's Name 32 characters
by-line title	2:85	bylinetitle	Photographer's title. For example, House photographer or correspondent etc 32 characters
caption/abstract	2:120	caption	Full text of caption 2000 characters
category	2:15	category	The subject of the image 3 letter code
city	2:90	city	City of image origin 32 characters
contact	2:118	contact	Contact for further image information 128 characters
content location code	2:26	contentlocationcode	Country in which the captured event took place 3 letter code
content location name	2:27	contentlocationname	Country in which the captured event took place; full name 64 characters
copyright notice	2:116	copyright	The image provider's copyright notice 128 characters
country/primary location code	2:100	primarylocationcode	Country in which the image was captured 3 letter code
country/primary location name	2:101	primarylocationname	Country in which the image was captured; full name 64 characters

IPTC Name	IPTC ID	LiquiFire Name	Field Description
credit	2:110	credit	Identity of the provider. Possibly an organization representing the capturer 32 characters
date created	2:55	datecreated	Date of event (not necessarily digitization time)
digital creation date	2:62	digitalcreationdate	Date digital conversion took place
digital creation time	2:63	digitalcreationtime	Time digital conversion took place
edit status	2:07	editstatus	Status of the object data 64 characters
editorial update	2:08	editorialupdate	Indicates edits made to other fields fieldID
expiration date	2:37	expirationdate	The latest valid date at which this image may be used
expiration time	2:38	expirationtime	The latest valid time at which this image may be used
fixture identifier	2:22	fixtureidentifier	
headline	2:105	headline	Synopsis of the subject matter 256 characters
image orientation	2:131	imageorientation	Portrait: P, Landscape: L, Square: S Single character code
image type	2:130	imagetype	Code representing image data composition
object cycle	2:75	objectcycle	For images with cyclic use, indicates Morning, Evening, or Both 1 character
object name	2:05	objectname	Image title 64 characters
original transmission reference	2:103	originaltransmissionreference	Provider's code indicating image transmission origin 32 characters
originating program	2:65	originatingprogram	Name of digitization program 64 characters
program version	2:70	programversion	Version of digitization program 10 characters

IPTC Name	IPTC ID	LiquiFire Name	Field Description
province/ state	2:95	province	Province or State of image origin 32 characters
reference date	2:47	referencedate	Provider origin date
reference number	2:50	referencenumber	Provider origin numeric code 8 characters
reference service	2:45	referenceservice	Provider origin service name 10 characters
release date	2:30	releasedate	Earliest permissible image utilization date
release time	2:35	releasetime	Earliest permissible image utilization time
source	2:115	source	Original image owner or creator 32 characters
special instructions	2:40	specialinstructions	Special handling instructions 255 characters
sub-location	2:92	sublocation	Identification of sub-location 32 characters
subject reference	2:12	subjectreference	Colon (:) separated list of Subject Reference Number, Subject Name, Subject Matter, Subject Detail Name 236 characters
time created	2:60	timecreated	Time of event (not necessarily digitization time)
urgency	2:10	urgency	Urgency, from 1 (most) through 8 (least) 1 digit
writer/editor	2:122	writereditor	Name of metadata author 32 characters

EXIF Metadata

Exif data is captured from images originating in any of the following formats: BMP, GIF, JPEG (JFIF/EXIF), PNG, SVG, XBM, XPM.

LiquiFire Name	Field Description
FNumber	Reciprocal of the aperture of the lens at time of capture
BitsPerSample	Number of bits per pixel sample
CompressedBitsPerPixel	Compression model used for the image, expressed in bite per pixel sample
ExposureTime	Time at which the image was captured
FocalLength	Focal length of the lens, in millimeters, at time of capture
SubjectDistance	Distance, in meters, to the subject
YCbCrSubSampling	Sampling ratio of chrominance components in relation to the luminance component.
XResolution	Horizontal image pixel density
YResolution	Vertical image pixel density
WhitePoint	Chromaticity of the white point of the image
PrimaryChromaticities	Chromaticity of the three primary colors of the image.
YCbCrCoefficients	The matrix coefficients for transformation from RGB to YCBCR image data
ReferenceBlackWhite	Reference black point and white point values
GPSLatitude	Latitude, in degrees, minutes, seconds, N/S
GPSLongitude	Longitude, in degrees, minutes, seconds, E/W
GPSAltitude	Altitude, in meters
GPSTimeStamp	Time of data acquisition
GPSDOP	GPS Degree Of Precision
GPSSpeed	GPS receiver speed of movement, in kilometers/hour (K), miles per hour (M), or Knots (N)
GPSTrack	GPS receiver direction of movement, in degrees
GPSImgDirection	Direction in which the image was captured, in degrees
GPSTDestLatitude	Latitude, in degrees, minutes, seconds, N/S, of the destination
GPSTDestLongitude	Longitude, in degrees, minutes, seconds, E/W, of the destination
GPSTDestBearing	Bearing to destination point, in degrees
GPSTDestDistance	Distance to destination point, in degrees
MakerNote	Manufacturer device identification information

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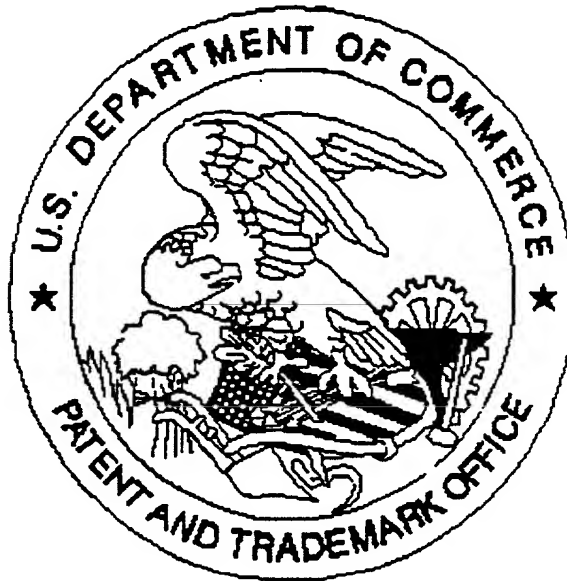
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